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Information Technology and Corporate Acquisitions

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I lovingly dedicate this dissertation to my wife, Yanfang Duan, who accompanied me on this long, arduous journey and freed me from every concern; to my daughter, Caroline, who brought me enormous, invaluable happiness; and to my parents for their constant, unwavering support.

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Information Technology and Corporate Acquisitions

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This dissertation examines how information technology can help acquirers to improve the performance of their acquisition targets. An acquisition creates value when the acquirer can generate more returns from the acquired business than its former owner can, a condition we call the acquirer's parenting advantage. Then, we introduce two IT-related sources of parenting advantage. Acquirers with more extensive process digitization can provide richer digitized resource to serve their newly acquired businesses, and acquirers with more related process digitization can unlock more synergies between the newly acquired and existing business units. So, as we argue, digitization extensiveness enables a digitization-revitalization mechanism for acquisition value creation, and digitization relatedness enables an integration-synergy-creation mechanism. Both mechanisms can be carried out through digital accommodation activities after acquisitions. Furthermore, the digitization gap between acquirers and targets is a major contingency for digital accommodation, with the second mechanism functioning mostly when the target has already had advanced digitization achievements. We empirically validated these hypothesized relationships by tracking the IT and performance changes in 109 U.S. hospitals before and after they were acquired, using a 7 year study timeframe.

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CHAPTER 1: INTRODUCTION

The U.S. hospital industry is consolidating. In 2004, 51.0% of U.S. hospitals operated independently rather than in affiliation with a multi-hospital system, while in 2009, the percentage was reduced to 44.6% (Sanofi-Aventis 2011). Healthcare practitioners and policy makers widely believe that fragmentation in the hospital industry is one of the sources of inefficiencies crippling care delivery in the U.S., and many of them *"believe [that] thoughtful consolidation [of hospitals] should yield a stronger, more competitive industry that keeps a lid on costs and improves quality"* (Beteze 2010, pp.43). However, empirical evidence on hospital acquisitions does not support this claim. Studies have found that hospitals in general do not improve their clinical performance after being acquired (Cuellar and Gertler 2005; Hayford 2012; Ho and Hamilton 2000; Huckman 2006), nor do their operations become more efficient (Dranove et al. 1996; Dranove and Shanley 1995).

The hospital industry is hardly an exception in this regard. Business scholars have repeatedly documented that acquisitions often disrupt rather than improve the acquired businesses (e.g., Cannella and Hambrick 1993; Datta 1991; Hitt et al. 1991; Paruchuri et al. 2006). However, research attention on the acquired business (the "target" hereafter) is at best sparse. Both acquisition practice and academic research appear to be acquirer-oriented. Acquisition performance is mostly measured as post-acquisition performance of the acquirer (Cording et al. 2010; Zollo and Meier 2008). Without disagreeing that acquirers must be able to create and appropriate value from their acquisitions, this paper instead introduces another theoretical angle that focuses on targets' resource utilization enhancement after acquisitions. The intellectual origins of our theory include the finance theory on the market for corporate control (Jarrell et al. 1988; Jensen and Ruback 1983;

Manne 1965) and the strategy theory that conceptualizes acquisition markets as alternatives to factor markets (e.g., Capron et al. 1998; Karim and Mitchell 2000; Wernerfelt 1984). Those theories commonly assume acquisitions as the workings of a corporate market in which alternative parent organizations compete for the rights to manage the resources of an otherwise standalone business. For an acquisition to be economically sound, an acquirer needs to justify its parenting advantage, or it needs to improve its target's performance in a way that cannot be accomplished if the target operates as a standalone entity or within its former parent organization. While corporate strategists leverage the notion of parenting advantage to justify the existence of diversified firms (Campbell et al. 1995; Goold et al. 1998), acquisition research from this angle is rare. Moreover, the literature has been silent on how to assess parenting advantage ex ante to an acquisition and how to leverage it during the acquisition. Exploring this new terrain will provide another way to understand how acquisitions create value.

In our theory, some firms are capable of doing acquisitions well not only because they possess transaction-level, acquisition-specific capabilities, but because their existing resource bases confer parenting advantages and they take appropriate actions to realize their parenting advantages during acquisitions. The premise of an acquirer's parenting advantage is that this acquirer can better utilize its target's resources, which in turn hinges on the provision of superior or synergistic resources that the target needs but otherwise cannot access. We call this resource provision process accommodation, through which the target taps into the acquirer's resource base and benefits from its new parent organization.

We are particularly interested in the role of information technology (IT) as a carrier of acquirers' parenting advantage. There is large and growing literature on IT-

induced competitive advantage (e.g., Kohli and Grover 2008; Nevo and Wade 2010; Sambamurthy et al. 2003). In addition, some IT scholars discuss how to leverage IT to coordinate and integrate multiple business units within a diversified firm to create synergies (e.g., Ravichandran et al. 2009; Tanriverdi 2005; Tanriverdi 2006). Following their logic, if IT could induce competitive advantage during regular operation periods in a multi-unit organization, we would suspect that acquirers could also leverage IT as part of their parenting advantage during acquisitions. However, with a few exceptions (Benitez-Amado and Ray 2012; Tanriverdi and Uysal 2011), the literature on IT in acquisitions has not focused on the performance effect of IT resources and activities during acquisitions (e.g., Henningsson and Carlsson 2011; Johnston and Yetton 1996; Mehta and Hirschheim 2007; Merali and McKiernan 1993; Wijnhoven et al. 2006). This dissertation links the aforementioned IT literature stream to the literature on IT in acquisitions by showing how acquirers can exploit, and consequently benefit from, their IT resources and capabilities built for regular operations to justify their parenting advantage during acquisitions.

This study is carried out in the U.S. hospital industry. It addresses some salient practical issues in the U.S. healthcare sector whose spending accounts for approximately 18% of the country's GDP (Zhang 2009). Many observers criticize the overall U.S. healthcare system as inaccessible, inefficient, and low quality (e.g., Herzlinger 2006; Levin-Scherz 2010; Nembhard et al. 2009; Porter and Teisberg 2004). To address these issues, many practitioners believe in industry consolidation because larger healthcare organizations are assumed to be more operationally efficient and able to afford more sophisticated technologies that can improve quality (Brown et al. 2012). However, merely forming larger multi-hospital systems will not guarantee scale-based benefits in either acquirers or targets. The findings of this study offer practical guidance for multi-

hospital systems with respect to assessing their resource readiness before acquiring new hospitals and proceeding with proper accommodation activities after acquisitions.

We take a hypothesis-testing approach in tackling our research question. In the next chapter, we build a theoretical model linking the characteristics of an acquirer's process digitization, the digitization gap between the acquirer and the target, digital accommodation activities carried out during acquisition implementation, and acquisition performance. In Chapter 3, we present our research design in order to empirically validate the hypothesized relationships using data gathered from the U.S. hospital industry. We report and discuss our results in Chapter 4 and then conclude the paper in Chapter 5.

CHAPTER 2: THEORY DEVELOPMENT

UNDERSTANDING ACQUISITIONS

Scholars in multiple disciplines have developed a variety of theories to understand why acquisitions happen and how they benefit either acquirers or improve social welfare (See compprehensive reviews in Haleblian et al. 2009; Seth 1990). For example, transaction cost economists consider acquisitions to be changes in organizations' boundaries that reflect the shifting efficiency balance between market- and bureaucracy-based transaction governance mechanisms; industrial organization economists often study acquisitions from the market power perspective that acquisitions eliminate competition and increase acquirers' bargaining power; and some agency theorists suggest acquisitions sometimes serve a means for acquirers' executives to pursue their own interests. Because this paper attempts to answer the question of whether and how acquirers can add parenting advantage to their targets, we develop our theory by focusing on mechanisms whereby acquirers help enhance the utilization of targets' resource.

To our knowledge, the earliest discussion on mechanisms of enhancing targets' resource utilization is from the finance literature. Some finance theorists consider acquisitions as reflecting the workings of the market for corporate control (Jarrell et al. 1988; Jensen and Ruback 1983; Manne 1965). According to this theory, a firm will be undervalued by capital markets and suffer discounted a stock price if it cannot generate maximum possible returns from the resources it controls. Then, alternative management teams who believe that they are capable of managing the same firm more efficiently will try to profit by taking over and revitalizing the firm. Thus, acquisitions serve as a means to discipline ineffective managers and reward effective ones (Jensen 1988).

Resource-based theorists in the strategy field scholars later developed another mechanism of enhancing targets' resource utilization. This literature considers

acquisitions as alternatives to discrete resource exchanges (Capron et al. 1998; Karim and Mitchell 2000; Wernerfelt 1984). Two organizations that find synergy potential between their resources would prefer realizing those synergies through contractual relationships and market-based resource exchanges. However, resources often exist and function in the form of a complementary system (Porter 1996), so it is often not feasible to carve out discrete resources for exchange. In addition, markets for some resources, especially tacit ones, are prone to fail because of valuation difficulties and information asymmetries between buyers and sellers (Capron et al. 1998; Karim and Mitchell 2000). So, acquisitions happen as one alternative means of exchanging non-perfectly-tradable resources (Capron et al. 1998; Wernerfelt 1984). For non-perfectly-tradable resources, a market for firms is a more robust resource exchange mechanism than a market for resources (Karim and Mitchell 2000).

Chatterjee (1992) compares these two streams of theorization by calling the first one a restructuring-based acquisition theory and the second one as a synergy-based acquisition theory. The two theories offer different approaches to explain how resources are enhanced through acquisitions. In the first theory, acquirers revitalize underperforming resources by transforming and restructuring the resources for usage optimization. In the second theory, acquirers create more value by combining complementary resources for synergies. With either approach, targets' resources are better utilized after joining their acquirers. Either way, we can say that acquirers are better parent organizations of the targets' resources than their former owners.

We synthesize the above arguments as follows. Firms are a governance structure consisting of processes that utilize resources to produce outputs (Williamson 1999). The opportunity for acquisitions arises when some firms believe that they could better utilize the resources currently possessed by other firms, either by more efficiently utilizing the

acquired resources or by combining resources from both parties (Karim and Mitchell 2000). Borrowing terminology from the diversification literature (Campbell et al. 1995; Goold et al. 1998), we call the market for firms *a corporate parenting market*. In this market, firms are subject to acquisitions if their resources can be better utilized under another corporate parent. An acquirer will have a parenting advantage if it can improve the utilization of a target's resources that is unachievable either by the target alone or within its former parent organization.

Our conceptualization of the corporate parenting market applies well to the U.S. hospital industry. U.S. hospitals are experiencing several disruptive environmental changes including regulation reforms and digital transformation (Agarwal et al. 2010; Fichman et al. 2011). Many hospitals lack the resources and capabilities to meet regulatory and competitive needs, so they become targets of new corporate parents (Brown et al. 2012). Standalone hospitals and hospitals with limited resources are particularly at a disadvantage. As one report from a consulting firm summarizes, *"the stand-alone community hospital may be, at long last, an endangered species. The scale and cost of administration and technology applications needed to comply with regulations that encourage healthcare institutions to compete on value rather than volume may finally be moving the needle to widespread consolidation."* (Beteze 2010, pp.42) Because hospitals licenses are limited and new hospital construction is costly, multi-hospital systems are expanding by acquiring hospitals that are struggling with new regulatory and competitive requirements, reflecting the workings of a hospital parenting market.

PROCESS DIGITIZATION AND IT-INDUCED PARENTING ADVANTAGE FOR ACQUIRERS

Resources that confer parenting advantage can have various constituents such as a superior management team, advantageous industry knowledge and routines, or exclusive access to scarce resources such as locations, intellectual property, brand names, or customer relationships. To serve as sources of parenting advantage, these resources need to be strategically valuable to targets, inaccessible to them prior to acquisitions, and redeployable to them after acquisitions. Many resources satisfy these criteria, but they may still be hard to leverage in acquisitions for at least two reasons. First, some resources, such as physical resources and managerial attentions, have capacity limits. So unless there is extra capacity, acquirers will not be able stretch these resources to serve the targets. Second, some other resources, such as knowledge and competencies, are either tacit or context-specific, making them hard to redeploy to targets.

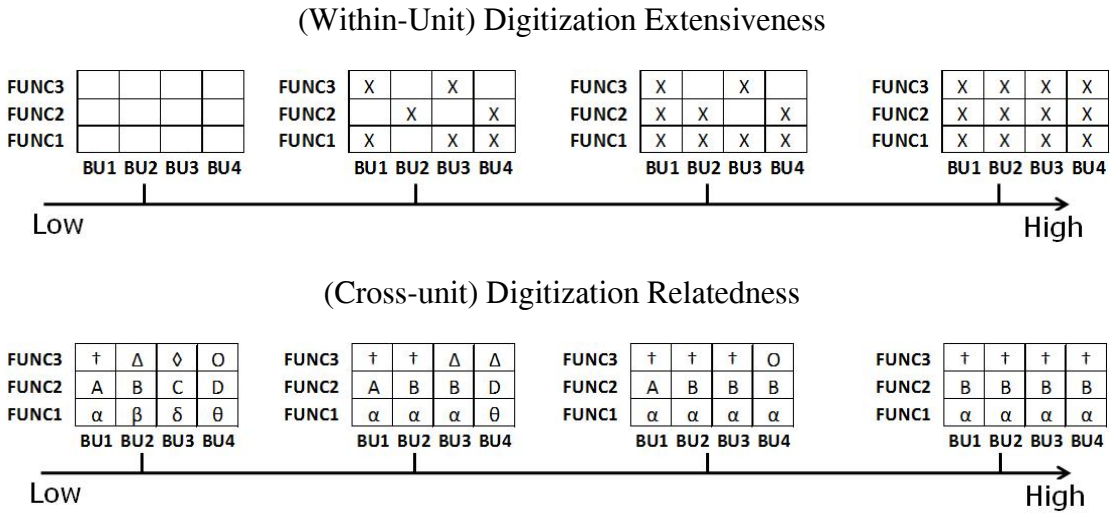
This paper focuses on digitized resources, especially those created through process digitization. Digitized resources are resources expressed in a 0/1 digital format. The consumption of digitized resources is not exclusive and mostly free of capacity limits (Gurbaxani and Whang 1991). Such "scale-free" resources often better serve as sources of parenting advantage in multi-unit organizations because consuming them in one unit does not preclude the consumption in other units (Levinthal and Wu 2010).

Sambamurthy and his colleagues (2003) discussed digitized processes as one important type of digitized resources. Process digitization refers to the organizational activities that articulate, automate, and transform business processes of an organization by expressing them in digital formats and coding them into IT artifacts such as algorithms, software packages, information exchange protocols, or data models (Sambamurthy et al. 2003). Digitized processes are often embedded with organizational knowledge- and capability. When digitizing a process, firms need to first uncover

capabilities required, stabilize, articulate, and often re-engineer their otherwise manual processes leading to these capabilities, and then codify or embed these processes into digital formats (Kohli and Grover 2008). The embedded knowledge and capabilities are relatively more redeployable following acquisitions because they have already been codified. In addition, some IT resources can be used as digital templates to make the redeployment more effective (Jensen and Szulanski 2007). For example, McAfee and Brynjolfsson (2008) gave an example of CVS, a U.S. retailing chain. CVS designed a new and more efficient prescription filling process. In deploying this new process, CVS embedded the new process into its enterprise IT system and then redeploy this system in its 4,000 stores. The new process is redeployed more effectively because the nuances of the process are encapsulated in the system and end users only need to learn a new system interface.

Firms often consisting of a variety of processes and multiple organization units typically digitize their processes piece by piece, unit by unit. However, firms advanced in digitization at the process-level may or may not have overall firm-level advantage (Ray et al. 2004). This paper proposes below that acquirers will have potential parenting advantage if they are advanced in two dimensions of process digitization at the firm level, including within-unit process digitization extensiveness and cross-unit process digitization relatedness. We adapt layered maps (Baldwin and Woodard 2009) as the visualization tool to describe the two dimensions of process digitization at the organization level as illustrated in Figure 1.

Figure 1: The Extensiveness and Relatedness of Process Digitization



Legend:

- **FUNC:** Business Function (a collection of business processes)
- **BU**: Business Unit
    - The "X" signs in the cells of Figure 2.1 represent whether a business function is digitized.
    - Various signs in the cells of Figure 2.2 represent different approaches (e.g., different software applications) to digitize the corresponding business function in different business units.

Digitization Extensiveness

We define digitization extensiveness as *the extent to which different processes in a firm have been digitized organization-wide*. Firms often digitize their processes by

functional domains and create corresponding IT-enabled capabilities. For example, previous studies have focused on digitized processes and IT-enabled capabilities in functions such as new product development (Pavlou and El Sawy 2006), supply chain management (Rai et al. 2006), or customer relationship management (Mithas et al. 2005). The more different types of processes are digitized, the higher the overall digitization extensiveness of a firm.

We argue below that digitization extensiveness can potentially increase acquirers' parent advantage through a *digitization-revitalization* mechanism. As discussed below, it creates parenting opportunities by creating an advantageous digital resource base and then ensures these opportunities seizable by forming digitization capabilities.

First, with higher extensiveness of process digitization, acquirers may find more opportunities to reuse their digitized resources to improve targets' operations. Extensiveness of process digitization implies many different processes and capabilities embedded during digitization. Acquirers can reuse these digitized processes to serve targets if the targets have manual processes that can be improved through digitization or if their existing process digitization is inadequate or ineffective. Because the distribution of digitization capabilities is often uneven across firms, those with extensive processes digitized may find abundant opportunities to acquire and revitalize other firms lagging in digitization. Moreover, digitized processes that have been implemented in a fragmented manner are often subject to substitution. For example, a firm without effective IT-based customer relationship management systems may set up human-based customer services teams and possibly achieve a similar level of effectiveness. When the digitization is extensive, firms will have opportunities to include multiple digitized processes through integrated IT solutions such as an ERP system, so these processes can work as a unified whole (Markus 2001). Acquirers with extensive process digitization thus can serve their

targets with a complete and interdependent set of digitized processes that is less substitutable with manual solutions and thus will be more valuable to the targets.

Second, with higher extensiveness of process digitization, acquirers are more likely to have generic process digitization capabilities. The task of digitizing one business process is not completely different from the task of digitizing another process. Each digitization effort shares common routines such as leveraging IT infrastructure (Broadbent et al. 1999), managing data and information (Mithas et al. 2011), or, on the business side, aligning IT and business strategies (Henderson and Venkatraman 1993), codifying knowledge and processes (Kohli and Grover 2008), change management (Kettinger and Grover 1995), end user training and so forth. So, digitizing one business process often serves as a learning opportunity for digitizing subsequent processes. Moreover, learning by doing similar tasks with a moderate level of variance enhances the learning effectiveness more than repeating exactly the same tasks (Schilling et al. 2003). Such learning spillover will happen in an iterative manner during the process digitization journey of an organization. With extensive digitization experience, firms can accumulate common skills and routinize common solutions across different digitization scenarios, which helps an organization create generic capabilities that can later create and adapt operational capabilities in specific contexts (Teece 2007; Zollo and Winter 2002). Because each target will be different, having generic digitization capabilities help acquirers seize their parenting opportunities and digitize their targets more quickly and efficiently.

Digitization Relatedness

We define process digitization relatedness as *the degree to which common technological resources and standards are implemented across organizational units to*

digitize the same processes. Corporate strategists first developed the construct of relatedness to describe the level of commonality of market, resource, or value chain attributes across business units in a multi-unit organization (e.g., Pehrsson 2006; Robins and Wiersema 1995; Rumelt 1974). IT scholars later adopted the construct to describe the cross-unit commonality of IT resources and practice (Tanriverdi 2005; Tanriverdi 2006). Overall, resource-based theorists generally agree that cross-unit relatedness is pivotal to justifying a multi-unit organization, and sharing common resources and processes across business units is particularly important to create cross-business synergies (Wan et al. 2011). Our digitization relatedness construct follows this line of intellectual history with a focus on process digitization activities.

We argue below that digitization relatedness can potentially increase acquirers' parenting advantage through an integration-synergy-creation mechanism. Similar to extensiveness, it also first creates parenting opportunities creating an advantageous digital resource base and then ensures these opportunities seizable by forming cross-business integration capabilities.

First, acquirers with high levels of digitization relatedness can better exploit both economies of scale and cross-unit synergy. Because IT accounts for a major portion of capital investment and operating expenses in contemporary firms, sharing common IT resources across business units will generate cost-reducing synergies including pooled purchasing power, reduced maintenance work, and reduced complexity of operations (Tanriverdi 2006). Moreover, compared to most other physical resources, digitized resources are often more scalable and can serve an increasing volume of operations with much lower marginal costs (Levinthal and Wu 2010). So, an acquirer with high digitization relatedness can spread its fixed IT investment across a larger scale of operations, and each unit, including a newly acquired one, will bear less IT expenditures.

In addition, a common IT resource base across organization units can work as a coordination and integration mechanism to help these units work as a unified whole and to unlock the synergies between them (Ravichandran et al. 2009; Tanriverdi 2006). The consistency and clarity of organization-wide IT standards are particularly important for firms with complex operations or in dynamic environments (Boh and Yellin 2006; Tiwana and Konsynski 2010; Wang et al. 2012). An acquirer with higher digitization relatedness can thus create more synergistic value across its existing business units, and a newly acquired one will benefit more if it can tap into the acquirer's IT resource bases characterized by higher cross-unit relatedness.

Second, digitization extensiveness reflects the integration and standardization experiences a firm has gone through in its process digitization journey. Persuading different organizational units to accept standardized IT resources often involves persuading them to sacrifice some local benefits in exchange for the benefits gained from global optimization (Ross et al. 2006). In accomplishing a high level of digitization relatedness across existing units, organizations will have learned from their experiences of moving from silo-ed IT resources, to IT resources standardization, to resource usage optimization, and possibly to architecture modularization (Ross 2003). As an organization gradually implements common IT standards across organizational units, it accumulates the capabilities of preparing and facilitating the conformance of the local units to global standards (Venkatesh et al. 2007). This learning is often iterative, as an organization applies its learning from standardizing one organizational unit to another unit, enriching that learning along the way. So, overall, a high level of digitalization relatedness often reflects a high level of cross-business integration capabilities (Tanriverdi and Uysal 2011). In acquisitions, it is particularly challenging for a target to conform to the acquirer's initially alien IT environments (Johnston and Yetton 1996;

Mehta and Hirschheim 2007). The target needs to be integrated intelligently. An acquirer with high digitization relatedness can apply its cross-unit IT integration capabilities to the post-acquisition IT integration situation and realize synergies while minimizing operational disruption and risks in the target (Tanriverdi and Du 2011; Tanriverdi and Uysal 2011).

REALIZING PARENTING ADVANTAGE THROUGH DIGITAL ACCOMMODATION

The extensiveness and relatedness of acquires' process digitization imply the potential of their parenting advantage, but the potential cannot be realized until the two parties achieve a proper level of integration. In the acquisition context, integration refers to the extent that targets' functions are linked to, aligned with, or centralized in the equivalent functions of acquirers (Zollo and Singh 2004). An acquisition will be implemented to a degree along an integration continuum from complete autonomy of targets to complete absorption (Pablo 1994), and it is possible that the final integration levels might vary across different functions.

In this dissertation, we are particularly interested in a subset of post-acquisition integration activities that aim to enhance the utilization of targets' resources. To accomplish this objective, acquirers need to provide targets with superior or complementary resources that targets need (Capron et al. 1998; Capron and Pistre 2002), while at the same time preserving targets' technical cores and improving their performance (Paruchuri et al. 2006). We define the resource provision activities to fulfill these objectives as accommodation[1]. Accommodation encompasses the activities that enable targets to tap into acquirers' sources of parenting advantage.

[1] In our use, "accommodate" means *"to provide with something desired, needed, or suited,"* Merriam-Webster's Dictionary

Acquirers can accommodate targets using a variety of resources. For example, accommodation might require capital investment (i.e., monetary accommodation) or management team replacement (i.e., managerial accommodation). However, as discussed above, digitized resources have unique advantages to serve as sources of parenting advantage because of their scalability and redeployability. So, we focus here on *digital accommodation* by which acquirers provide their digitized processes to address targets' process digitization needs and improve targets' resource utilization efficiency and effectiveness.

One IT executive from a multi-hospital organization gave an example of digital accommodation during acquisitions as follows: *"When we pull all these new hospitals onto our [IT] systems, number one, you get the advantage of the intellectual property that went into the design [of the IT systems]. A lot of these community hospitals can't afford to have people sit down and figure out what's the best practice, what's the best order set, what's the medical efficacy of using one drug versus another. So, we leverage our clinical intellectual property that's already been used to build this system."*(Tanriverdi and Du 2011:7) In this case, the acquirer had digitized its clinical knowledge and practice into IT systems. Then, following acquisitions, it digitally accommodates its newly acquired hospitals by implementing these IT systems instead of transferring the knowledge and practice to them by training, instruction, and process changes. The acquirer believes that this accommodation activity will improve the acquired hospitals' performance by providing them with some import resources they cannot gain access to otherwise. So, in this quote, the IT systems serve as a carrier of acquirers' parenting advantage, and they are provided to the targets through digital accommodation.

We summarize below that digital accommodation is a necessary intermediate step for acquirers with extensive and related process digitization to leverage their digitized

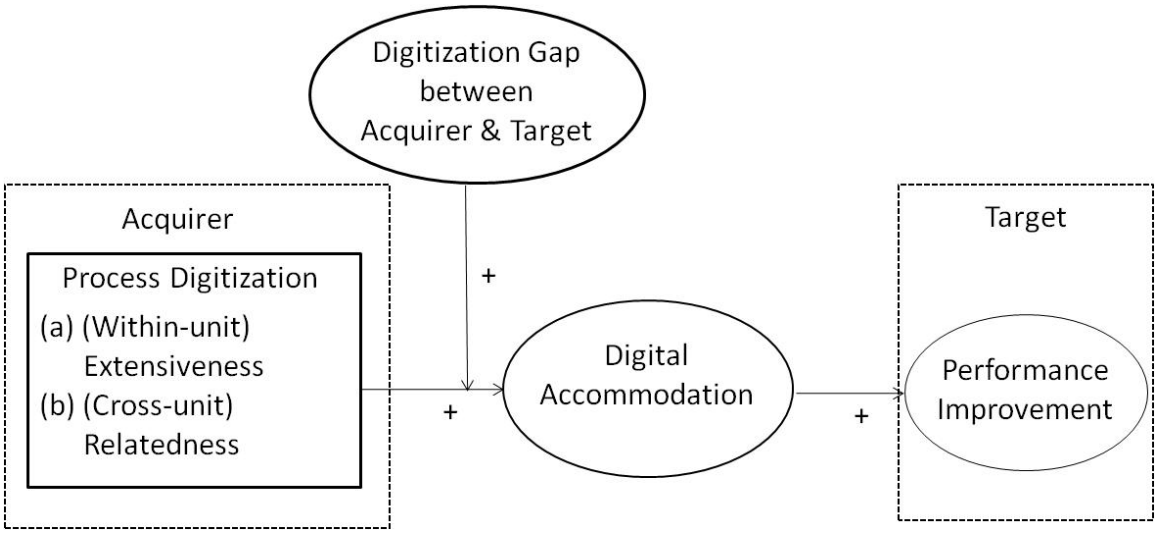
resources and realize their parenting advantage. Acquirers with high level of digitization extensiveness will have a higher variety of digitized resources, some of which are potentially needed by but inaccessible to targets. Digital accommodation allows acquirers to selectively provide targets with these digitized resources, including both the technological resources and the knowledge or capabilities embedded in them. Moreover, as we argued above, because acquirers can learn from their extensive digitization experiences, they are capable of adapting these resources to their target's unique situation more competently. So, a higher level of digitization extensiveness in an acquirer will create and enable more accommodation opportunities during acquisition implementation, which in turn leads to greater improvement in the target's performance.

Similarly, acquirers with high levels of digitization relatedness will already have multiple business units operating using similar digitized processes. Digital accommodation allows targets to tap into acquirers' common environments, which will in turn help targets benefit from synergies with other units. Moreover, as we argued above, because acquirers will have learned from their experiences of pursuing internal relatedness, their cross-business integration capabilities will accomplish targets' migration more efficiently and effectively. So, a higher level of digitization relatedness in an acquirer will incentivize and enable more accommodation activities during acquisition implementation, which in turn leads to greater improvement in targets' performance. So in summary, we hypothesize that

H1: Digital accommodation mediates the positive influence of an acquirer's process digitization (a) extensiveness and (b) relatedness on the performance improvement of its target after the transaction.

Figure 2 below summarizes our conceptual model.

Figure 2: The Conceptual Model



EXPLOITING THE DIGITIZATION GAP OF POTENTIAL ACQUISITION CANDIDATES

The premise of our theory is that targets' resources are under-utilized relative to what they could achieve if affiliated with acquirers. We define the digitization gap as the relative strength of the acquirer to the target with respect to their process digitization prior to the transaction. By this definition, the digitization gap could be either positive or negative, depending on the relative strength of the two transaction parties in their process digitization. The party with stronger process digitization is more advanced in process digitization and thus possibly generates more value from it. Although not directly related to digitization, the concept of resource gap has been developed in several previous acquisition studies (e.g., Capron et al. 1998; Capron and Mitchell 2009; Eschen and Bresser 2005).

When targets' processes are less digitized, we argue that acquirers have more opportunities to digitize and revitalize the targets and have more pressure to do so. First, because targets are less digitized, the opportunities of process digitization are abundant, and returns on digitization investments are likely to be higher. In addition, when the digitization gap is high, the acquirer will be under the pressure to improve the target's operation promptly rather than leave its target as is and change the target at a steadier pace (Barkema and Schijven 2008b). So, the acquirer with extensive digitization will tend to fill in the digitization gap of the target more aggressively, manifested as higher levels of digital accommodation. In this case, acquirers accommodate targets by using acquirers' digitized processes in order to enhance the efficiency and effectiveness of targets' resource utilization. The mechanism of value creation is mainly to purchase an underutilized resource bundle and revitalize it through digitization, and targets are not necessarily coordinated or integrated with acquirers' other units. Acquirers' digitization extensiveness will be the primary value-creation enabler. So, we hypothesize that:

H2a: The influence of an acquirer's digitization extensiveness on the level of digital accommodation will be stronger when the target is less digitized than the acquirer prior to the acquisition. The larger the digitization gap, the stronger the influence.

When targets' processes are more digitized, we argue that acquirers have more opportunities to integrate the targets, which requires higher levels of cross-business integration capabilities. In this case, digitization gap filling opportunities are limited, but acquirers are usually still under pressure from various stakeholders to show acquisition value. So, acquirers will be forced to rely more on integration mechanisms for synergistic value creation, which requires providing targets with synergistic and complementary resources from acquirers' others organizational units. To achieve this, acquirers need to integrate the targets by using IT-based integration approaches such as sharing the same

applications, adopting the same data definitions, and pursuing the same IT policies, procedures, and strategies (Tanriverdi and Uysal 2011). However, when targets already have their legacy IT systems and processes in place, integration is challenging due to both technical and political barriers (Mehta and Hirschheim 2007; Wijnhoven et al. 2006). To accomplish higher levels of digital accommodation, acquirers will need to have accumulated cross-business IT integration capabilities as a result of pursuing high digitization relatedness. If targets' processes are less digitized, IT integration capabilities will have less influence because the accommodation tasks resemble typical IT system rollout projects rather than integration projects. So, we hypothesize that:

H2b: The influence of an acquirer's digitization relatedness on the level of digital accommodation will be stronger when the target is more digitized than the acquirer prior to the acquisition. The larger the digitization gap, the stronger the influence.

CHAPTER 3: METHODS

RESEARCH CONTEXT

This study is conducted in the context of U.S. hospital industry. U.S. hospitals are generally organized in two different forms: standalone hospitals and members of multi-hospital systems. A multi-hospital system owns and operates multiple hospitals and sometimes also other kinds of healthcare delivery facilities. Unlike other types of hospital alliances such as a group purchasing organization in which hospitals are only loosely connected for a specific purpose, a multi-hospital system controls its member hospitals through direct ownership or sometimes long-term operating lease. A typical hospital acquisition is defined as the transfer of the ownership of one or more hospitals from the former owner to the acquirer[2].

SAMPLE AND DATA SOURCES

The study sampling frame consists of all the hospitals acquisitions in the United States from 2006 to 2008. We further collected IT and performance information in a timeframe from one year prior to the transaction to three years after the transaction, making the data collection period 2005 to 2011.

The study dataset was built based on five archival data sources. First, hospital-level IT application data are obtained from the Dorenfest Institute for H.I.T. Research and Education Database[3] (now referred to as HIMSS Analytics, or the HA database). The HA

[2] The words merger and acquisition have been commonly used as exchangeable in academic research. However, some researchers studying hospital transactions distinguish them by defining mergers as transactions between two standalone hospitals and acquisitions as transactions between multi-hospital systems or between one multi-hospital system and one standalone hospital (Huckman 2006). This study follows Huckman (2006)'s definition because our digitization construct implies multi-unit organization and we do not have visibility to the inner structure of a standalone hospital. So, in our sample, the acquirer will always be a multi-hospital system, with each member hospital as one organizational unit, while the target could be standalone hospitals or hospitals formerly affiliated with another multi-hospital system.

[3] The Dorenfest Institute for H.I.T. Research and Education, HIMSS Foundation, Chicago, Illinois, 2010.

database is one of the most comprehensive databases containing detailed information about the installation of IT applications in U.S. healthcare facilities. It has been widely used in previous healthcare IT research (e.g., Angst et al. 2010; McCullough and Snir 2010). Second, hospital acquisition data are collected by combining the entity history records in the HA database and hospital acquisition transactions tracked by Standard & Poor's Capital IQ database. Third, financial and operational data of hospitals are extracted from Medicare's Healthcare Cost Reporting Information System (HCRIS) database. In the U.S., all the Medicare-registered hospitals are mandated to submit annual cost reports (CMS Form 2552-96 and 2552-10) including their financial statements. The Centers for Medicare and Medicaid Services (CMS) publishes these reported data as the HCRIS database. Forth, quality data of hospitals are directly extracted from the Medicare's Hospital Compare database. Reporting to Hospital Compare is voluntary, but after the Medicare Modernization Act of 2003, the CMS provided a financial incentive for hospitals to join, and 98% of Medicare-registered hospitals ultimately began to report (Werner and Bradlow 2006). Lastly, we collected data on case-mix index, an indicator of the average severity and complexity of diseases treated in a hospital, from Medicare's Hospital Inpatient Prospective Payment System (IPPS) datasets.

The unit of analysis in this study is acquired hospitals. If multiple hospitals are acquired in one transaction, each hospital is considered as a separate acquisition target. The sampling process started by selecting hospital acquisition records from the entity history tables of the HA database that tracks acquisition transactions of both individual hospitals and multi-hospital systems. The records were then checked against the hospital acquisition records retrieved from the Capital IQ database to verify accurate transaction time. Capital IQ also includes descriptions of both transaction parties and the transaction terms. Based on the Capital IQ information, we dropped acquisitions involving only

partial ownership change (such as forming joint ventures) and acquisitions between the two transaction parties with a history of facility leasing or management relationships so that the performance variables would better reflect the influence of an acquisition but not of other arrangements. These initial sampling criteria yielded a sample of 291 hospitals that had been acquired between 2006 and 2008 in 199 transactions. The sample size decreased when we filtered out 4 specialty hospitals and 42 hospitals that are involved in more than one transaction in our study timeframe. Specialty hospitals are excluded because they may not have performance indicators comparable with regular hospitals, and hospitals involved in multiple transactions are excluded because we cannot separate the performance impact of one transaction from another on them. We further lost others due to inadequate data, as summarized in Table 1 below. The final sample size for analyses is 109.

Table 1: Sample Construction Process

Sample Selection Steps		# firms
1	Hospitals that had been acquired between 2006 and 2008 (inclusive)	291
2	Hospitals dropped due to involvement in transactions more than once	(42)
3	Hospitals dropped because they are specialty hospitals	(4)
	Subtotal	245
Data Collection Steps		
4	Observations dropped due to missing necessary IT data one year prior to the transaction	(40)
5	Observations dropped due to missing necessary IT data two years after the transaction	(12)
6	Observations dropped due to missing necessary data on hospital quality outcomes	(60)
7	Observations dropped due to missing necessary financial data	(20)
8	Observations dropped due to missing necessary data for control variables	(4)
	Total	109

MEASUREMENT

We summarize the notation, measurements, timing, data sources, and rationale for including of all study variables in Table 2. We also illustrate the time structure of the research design in Figure 3. We assume that an acquisition happens at year ***t*** in all the notations below.

Figure 3: The Time Structure of the Research Design

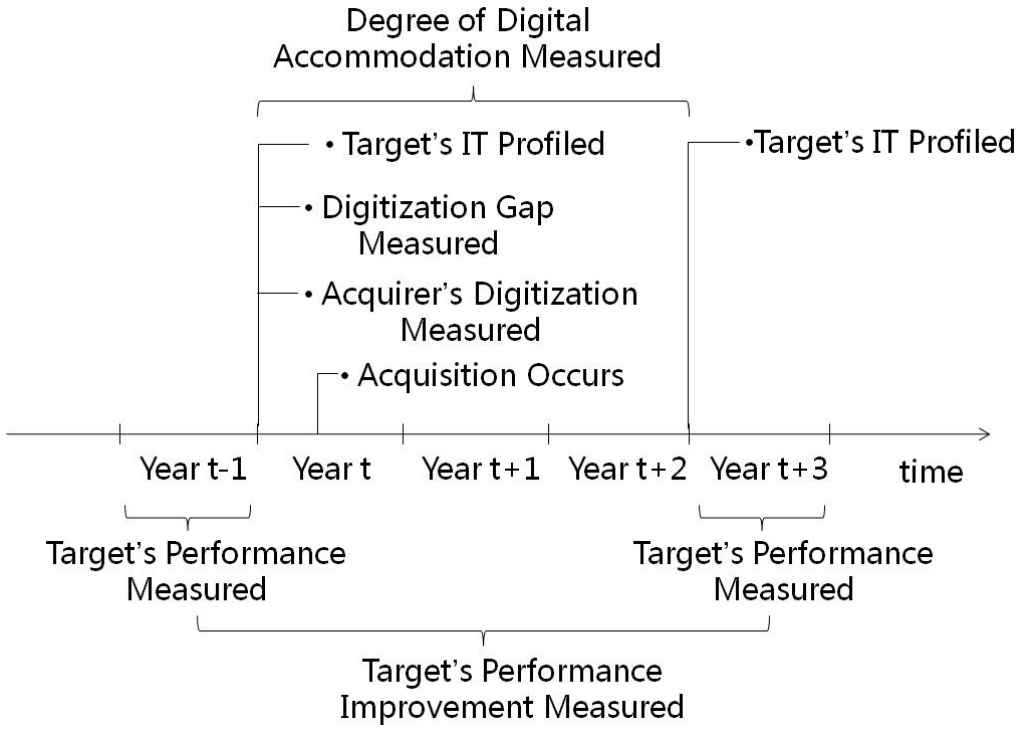


Table 2: Summary of Control Variables

Variables	Measurement	Subject	Timing	Data Source	Rational to Include (for Control Variables)
IT application similarity	The percentage of functions provided in the target that had been digitized by using the same software products that are in use in the acquirer	Acquirer-target	t-1	HIMSS Analytics (HA)	• The IT application similarity between the acquirer and the target may reduce the need for digital accommodation. • Target's performance may improve simply because the application similarity reduces frictions during integration (Homburg and Bucerius 2006).
Acquisition Experience	The number of acquisitions the acquirer made in the three years prior to the acquisition	Acquirer	[t-3,t-1]	HIMSS Analytics (HA), Capital One	• Acquirers can learn from their previous acquisition experiences and be more capable of accommodating the target and then improve its performance (Barkema and Schijven 2008a).
Relative Size	The ratio of the target's bed size to the total bed size of the acquirer	Acquirer-target	t	HIMSS Analytics (HA)	• The larger the relative size of the target to the acquirer, the more bargaining power it has in making IT investments that do not conform to the acquirer's standards (Mehta and Hirschheim 2007). • The larger the relative size of the target, the less extra scale-based benefits it can expect from joining an even larger organization.

Variables	Measurement	Subject	Timing	Data Source	Rational to Include (for Control Variables)
Geographic Proximity	A dummy variable indicating whether the acquirer has prior presence in the target's state (1 = yes)	Acquirer-target	t	HIMSS Analytics (HA)	• Multi-hospital systems could pursue an acquisition for competitive reasons such as creating a monopoly in a region or consolidating certain medical services by redirecting patient traffic (Huckman 2006) to other institutions, which requres geographic proximity. • In addition, many regulations are state-specific, so having presence in the target's region prepares the acqurier for the acquisition from a regulation perspective and may smooth the target's transition and recude disruption on the target.
Organizational Similarity	A dummy variable taking [1] if any existing member hospitals of the acquirer (1) has the same teaching status of the target, (2) has its size within [80%, 120%] range of the target's, and (3) also has its net income within [80%, 120%] range of the target's; [0] otherwise;	Acquirer-target	t	HIMSS Analytics (HA), HCRIS	• A member hospital similar to the target serves as a template for the target's digitization, which may accelerate the digital accommodation process. • Organizational similarity reduces frictions in acquisitions and improves acquisition performance (Ellis et al. 2011; Homburg and Bucerius 2006).
For-Profit Status Difference	A dummy variable indicating whether the transaction is between a for-profit organization and a non-for-profit organization (1 = yes)	Acquirer-target	t	HIMSS Analytics (HA)	• For-profit and non-for-profit organizations may have different demands and different priorities for IT investments. A difference between the for-profit statuses of the two parties may create hurdles in digital accommodation. • For-profit and non-for-profit organizations may have different approaches and priorities in efficiency and quality improvements. A difference between the two parties may reduce the benefits the target can accrue from the acquisition.

Variables	Measurement	Subject	Timing	Data Source	Rational to Include (for Control Variables)
Operational Expansion (Shrinkage)	The changes of the staffed bed size of the target between t-1 and t+2	Target	[t-1,t+2]	HIMSS Analytics (HA)	• These business changes happening in the target could account for some performance difference in the target before and after the transaction.
Independent IT investment	The number of times that software in the target's digitization profile is newly installed or replaced within 2 years after the acquisition as long as the change does not conform to the acquirer's standards.	Target	[t-1,t+2]	HCRIS	• Instead of embracing digital accommodation, the target could make IT investments at its own discretion possibly by leveraging the financial or managerial resources of the acquirer. Such IT investments may also contribute to performance improvement in the target
Type of transaction	Two dummies variables to indicate whether (1) the target is acquired from another multi-hospital system, and (2) the target is acquired when another multi-hospital system is acquired in its entirety.	Target	t-1	HIMSS Analytics (HA)	• Acquiring a hospital from another parent organization creates more disruptions in the target's operation, which may reduce its performance improvement after the acquisition. • Acquiring an entire multi-hospital system preserves the integration across these acquired hospitals, which may reduce the benefit each of them can harvest from being acquired.
For-profit Status of Acquirer	A dummy variable taking [1] if the acquirer is an for-profit organization; [0] otherwise;	Acquirer	t	HIMSS Analytics (HA)	• For-profit organizations are expected to be under more pressure to pursue performance improvement especially in efficiency (Dranove 1998).
Size of Target	The total bed size of the target	Target	t-1	HIMSS Analytics (HA)	• The size of an organization influences the difficulty in improving its performance through acquisitions (Moeller et al. 2004)
Age of Target	The number of years since the target was formed	Target	t	HIMSS Analytics (HA)	• Newer hospitals suffer less from legacy equipment and practice, and can embrace new technology and practice more effectively (Kohli et al. 2012).

Variables	Measurement	Subject	Timing	Data Source	Rational to Include (for Control Variables)
Teaching Status of Target	A dummy variable taking [1] if the target trains medical residents; [0] otherwise	Target	t	HIMSS Analytics (HA)	• Teaching hospitals typically have higher medical expertise to provide state-of-art healthcare so they may benefit less from an acquisition (Dranove 1998; Kohli et al. 2012).
Financial Slack of Target	A dummy variable taking [1] if the target produced positive operating income; [0] otherwise. A dummy variable is used due to the high skewness of the continuous measure of net operating income.	Target	t-1	HCRIS	• Three financial measures of the target are included to account for different aspects of a target under financial distress and at risk of bankruptcy. Financial slack measured by operating gains/losses captures whether the target has sufficient resources for making IT investments, debt-asset ratio and liquidity account for the long-term and the short-term pressures on the target to repay its debts. Under difficult financial conditions, the target may be lagging in IT investments and suffer inferior performance, and both of which may be improved by being acquired.
Debt-Asset Ratio of Target	The ratio of the balance of debt to the balance of asset of the target	Target	t-1	HCRIS	
Liquidity of Target	The ratio of the balance of current asset to the balance of current liability of the target	Target	t-1	HCRIS	
Year dummies	A set of dummy variables indicating the year the focal target hospital was acquired	Target	t		• Acquisitions often happen in waves, and acquirers in the late stage of the wave may be less rational (McNamara et al. 2008). In addition, there has been an ongoing trend in pushing for healthcare IT investment and improving quality from regulation in recent years, so both of these may improve over time as a reflection of the industry trend.

Dependent Variables

The dependent variable is performance improvement of the target. Because cost containment and quality improvement are two priorities of healthcare delivery organizations and they often have different demands on IT systems (Menon et al. 2009), we consider the improvement in the efficiency of hospital operations and the quality of care delivery processes separately as two dependent variables. Because financial performance will also reflect market-based factors such as monopoly power and market concentration, our focus on operational rather than financial performance enables us to focus on the efficiency and effectiveness of resource utilization and rule out market-based alternative explanations.

The efficiency of hospital operations is typically measured as the average cost per case-mix-adjusted discharges in a hospital in a given year (Dranove and Shanley 1995). The CMS reports a case-mix index for each hospital that reflects the clinical complexity and severity of this hospital's discharged patients. Efficiency (EFC) was calculated as EFC = - Operating Costs / (Total Discharges × Case-Mix Index). We reversed the formula so a larger value refers to a higher level of efficiency. The efficiency improvement was calculated as $EFCImprv_{t+3} = EFC_{t+3} - EFC_{t-1}$. A three-year time window after acquisition is used to allow for the performance impact of accommodation activities to emerge. We trimmed EFCImprv at the 1st and 99th percentile, excluding 3 extreme observations from the final sample[4].

[4] Two of the three observations dropped had a bed size larger than the number of its annual discharges, and the operating costs of the third one increased ten times in a single year, both suggesting something unusual or an error in the data. There is a clear discontinuity of EFCImprv's values at the 1st and the 99th percentile. So we concluded that these three extreme cases are driven by either extreme situations or reporting mistakes and excluded them from analyses.

The quality of care delivery processes is measured based on the process-of-care quality indicators reported in the Hospital Compare database. Hospital Compare has maintained a collection of quality indicators for selected medical procedures since 2005. The number of indicators has increased overtime, and we utilized the 20 indicators that have been reported in all the years within our study time frame to ensure comparability. Each hospital was assigned a score for each quality indicator in the database in a given year. For example, one indicator is the percentage of patients with acute myocardial infarction who are given aspirin at arrival. In addition, hospitals also report the number of acute myocardial infarction patients sampled to calculate their reported percentage. We then calculated a composite quality measure (QUL) for a given hospital-year as the average of the quality scores across all the 20 indicators, weighted by the number of patients each quality indicator is based on (Shwartz et al. 2008). Then, the quality improvement was calculated as $QULImprv_{t+3} = QUL_{t+3} - QUL_{t-1}$. The details of these 20 indicators are reported in Appendix 1. Due to data availability constraints, we could not use outcome-of-care quality measures, but we explored the correlations between the two types of quality measures and report the details in Appendix 1.

Primary Explanatory Variables

The primary explanatory variables in this study include the levels of the extensiveness and the relatedness of an acquirer's process digitization, the level of digital accommodation, and the digitization gap between the target and the acquirer, and. To measure these four constructs, we first developed an approach to depict a hospital's digitization profile at a given time as explained below.

Because IT applications are usually implemented based on functions, we use functions as the atomic unit in a digitization profile. We consider functions to be

collections of business and clinical processes. We began by identifying a list of business functions that most hospitals need and commonly accept as candidates for digitization. The HA database classifies and tracks around 120 functions potentially needed by at least some types of care delivery facilities. We selected all the functions possessed by more than 75% of non-specialty hospitals in any year in our study time frame. This process yielded 70 functions. We then defined one function as digitized in a hospital at a given year if an IT application was reported live and operational to fulfill, enable, or support this function in this hospital according to the HA database. Based on this definition, U.S. hospitals on average had digitized 65% (std. = 22%) of these functions as of 2010 according to our dataset. Appendix 2 describes more details of the data source as well as the list of these functions. Then, the digitization profile of any hospital is created as a subset of these 70 functions provided in this particular hospital, their digitization status, and the specific software product installed to digitize each function. We present two digitization profile examples in Appendix 2.

Extensiveness of Process Digitization

We calculated a digitization ratio as the number of functions digitized divided by the total number of functions present based on a hospital's digitization profile. Then, we measured the extensiveness of process digitization as the average of digitization ratios of all member hospitals in a multi-hospital system, weighted by the bed sizes of these member hospitals. Assuming that in a multi-hospital system with N_t hospitals in year t, the bed size of the i^{th} hospital is H_{it}, and this i^{th} hospital has digitized M_{it} out of T_{it} number of functions, then, the extensiveness of process digitization EXT_t is given by:

$$EXT_t = \frac{\sum_{i=1}^{N_t}((H_{it} \times \frac{M_{it}}{T_{it}})}{\sum_{i=1}^{N_t} H_{it}}$$

Relatedness of Process Digitization

We use an entropy measure to capture the relatedness level of process digitization across member hospitals of a multi-hospital system. Entropy-based measures have been used in a wide range of science and engineering disciplines to describe the diversity of a system and have also been adopted to describe business relatedness (Bryce and Winter 2009; Palepu 1985). We use the entropy of IT applications used in a multi-hospital system to measure the level of commonality in process digitization activities across its member hospitals (Chi et al. 2010). Assuming that the total bed size of an acquirer is H_t in year t, the acquirer implements M_{it} different software application products to fulfill the same function i across its existing member hospitals, and the j^{th} software product in fulfilling function i is implemented in a number of hospitals whose total bed size is B_{jit}, then, the relatedness of this i^{th} function in this acquirer is given by:

$$RLD_{it} = -\sum_{j=1}^{M_{it}}(\frac{B_{jit}}{H_t} Ln \frac{H_t}{B_{jit}});$$

The advantage of an entropy measure is that it takes in to account the total number of different software products implemented and the portion of a multi-hospital system served by each product. The negative sign of the formula ensures that a higher value represents a higher level of relatedness. With this measure, for example, when M_{it} =1, it means that all member hospitals of the acquirer uses the same one software application to fulfill the same function i. Then $B_{jit} = H_t$ and RLD_{it} =0, meaning that there there is no diversity across member hospitals in digitizing the function i and the relatedness level is the highest possible level. The value of this measure decreases either

when a larger number of different software products are implemented or when multiple software products each serve a similar portion of the multi-hospital units. For example, a multi-hospital system may have two different electronic medical record systems (EMR) implemented in its member hospitals to manage medical records, each serving 50% of the multi-hospital system in terms of bed size, then, $RLD = -\sum_{j=1}^{2}(0.5 \times Ln\frac{1}{0.5}) = -0.693$. If this multi-hospital system has three different EMR systems, each serving 1/3 of this multi-hospital system, then $RLD = -\sum_{j=1}^{3}(\frac{1}{3} \times Ln3) = -1.099$, representing a lower level of digitization relatedness across member hospitals for EMR. If this multi-hospital system has three different EMR systems, but they serve 80%, 10%, and 10% of this multi-hospital system each, then$RLD = -0.8 \times ln\left(\frac{1}{0.8}\right) + 0.1 \times ln\left(\frac{1}{0.1}\right) + 0.1 \times ln\left(\frac{1}{0.1}\right) = -0.409$, representing a higher level of relatedness because there is clearly one dominant application in use out of the three.

Finally, we take the average of the relatedness levels across all the functions digitized to get an organization level measure. Assuming the total number of functions digitized in a multi-hospital system is pt and the relatedness level for the i^{th} function is RLD_{it}, then the organization level measure of digitization relatedness is given by:

$$RLD_t = \frac{1}{p_t}\sum_{i=1}^{P_t} RLD_{it}$$

Digital Accommodation

We compare a target's digitization profiles at year t+2 and at year t-1 to measure the level of digital accommodation happening in the acquisition. Specifically, we measure the level of digital accommodation as the number of incidents of newly installing or replacing software products in the target's digitization profile within 2 years after the acquisition, if and only if such incidents satisfy the following two criteria: (1)

the new installation or replacement had not been scheduled and was not in progress prior to the acquisition; and (2) the newly installed software conforms to the acquirer's standards of software selection in fulfilling the same function (i.e., the same software is currently used in the acquirer for the same function). The first criterion assures that the target's digitization profile changes are attributable to the acquisition, and the second criterion assures that the changes are attributable to acquirers' resource provision rather than independent IT investments made at the targets' discretion.

Digitization Gap

We measured the digitization gap between an acquirer and a target by comparing the digitization profiles of the acquirer and the target at year t-1. We created two versions of digitization gap measures to validate our hypotheses. First, we measure digitization gap as a dummy variable that takes 1 if an acquirer has higher digitization extensiveness than a target and 0 otherwise. We used only digitization extensiveness as the proxy of the strength of an organization's process digitization, while relatedness does not apply because each target is treated as a single unit. Second, we measure digitization gap as a continuous variable that is as the numerical difference between the acquirer's and the target's digitization extensiveness. The measure will be negative when the target has a higher level of digitization extensiveness than the acquirer.

Control Variables

As summarized in Table 2, we controlled for a set of variables capturing characteristics of acquirers, the targets, and the transactions when explaining the level of digital accommodation and the performance improvement.

We controlled for 6 factors in explaining the level of digital accommodation in an acquisition. We controlled for the IT application similarity between the target and the

acquirer's IT profiles at t-1 because high similarity may reduce the necessity of digital accommodation. The similarity is measured as the percentage of functions in the target that are digitized using the same software products that were in use in the acquirer prior to the acquisition. Then, we controlled for the acquisition experience of the acquirer in the three years prior to the focal acquisition to account for the learning effect of an acquirer, who may be more skillful in accommodating its targets by learning from past acquisition experience (Barkema and Schijven 2008a). We further controlled for four factors related to both the interdependence and the similarities of the two parties, which may influence post-acquisition IT decisions due to both economical and political reasons (Mehta and Hirschheim 2007). Details are reported in Table 2.

We controlled for 18 factors in explaining the performance improvement of the target after the acquisition. First we needed to account for one important alternative explanation that the target's performance improvement is driven by other non-IT changes happening in the two years after the acquisition. We particularly consider the expansion/shrinkage of the target's operations that could reflect many business changes in the target. We considered both the change of bed size and the change of total number of employees in the target. Our results are robust to the inclusion of either one of them or both, and we report the results below with the changes of bed size being controlled. Second, we controlled for the independent IT investment made in the target to rule out another important alternative explanation that performance improvement could be caused by any IT investments rather than by digital accommodation in particular. Independent IT investment is measured by the number of times software products were installed or replaced in the target's digitization profile within 2 years after the acquisition, if the newly installed software has not been used in the acquirer to enable the same function. Further, we controlled for the types of transaction to capture the different origins of

acquired hospitals, as hospitals can be acquired as standalone entities, as divestitures from another multi-hospital system, or acquired when another multi-hospital system is acquired in its entirety. Other controls are presented in Table 2, which summarizes the details of measures and the rational-to-include for all control variables.

Table 3 presents descriptive statistics and correlations among the study variables. According to means of study variables in this table, after acquisitions the quality of targets' care delivery on average slightly improved but the efficiency of care delivery on average decreased. So we have partial and preliminary evidence that hospital acquisitions may not on average improve care delivery at least in the efficiency dimension, which is consistent with previous hospital acquisition studies. In addition, the mean of digital accommodation is 16.58, meaning that on average targets will have around 17 new IT applications installed in two years after acquisitions. Given the population size of applications as 70, this number suggests active digital accommodation activities on average after hospital acquisitions. Lastly, as suggested by the mean of digitization gap, acquirers have a higher level of digitization extensiveness than their targets in 59% of the cases. This percentage reflects that acquirers are more likely to have more extensive process digitization, providing indirect evidence that acquirers might be actively exploiting their advantages in digitization. However, still, in 41% of cases the targets have higher digitization extensiveness, which may reflect the fact that IT is only one of many factors to consider in making an acquisition decision.

Table 3: Descriptive Statistics and Correlation Coefficients.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Quality Improvement														
2. Efficiency Improvement	-.03													
3. Digital Accommodation (DA)	.15+	-.09												
4. Digitization Extensiveness (EXT)	.12	-.04	.40**											
5. Digitization Relatedness (RLD)	.15+	.10	.09	.07										
6. Digitization Gap (DG) (1 = acquirer more digitized)	.06	-.03	.08	.39**	.09									
7. IT Application Similarity between the Target and the Acquirer	-.05	-.15	-.01	-.02	-.36**	.07								
8. For-profit Status Difference (1 = having difference in for-profit status)	.26**	-.02	-.00	-.16*	-.15*	-.23**	.15*							
9. Relative Size of the Target to the Acquirer	.01	-.03	-.07	-.14*	.35**	-.10	-.11+	.04						
10.Geographic Proximity (1 = co-present in the same state)	.04	.02	.13+	.12+	.15*	.09	.04	-.22**	-.21**					
11.Organizational Similarity	-.17*	-.04	-.14*	-.17*	-.12+	.08	.09	-.02	-.11	.06				
12.Acquisition Experience of the acquirer	.10	-.00	-.06	-.37**	-.44**	-.33**	.05	.30**	-.26**	-.06	.12+			
13.Expansion (Shrinkage) of the Target	.03	.18*	-.07	-.11	-.05	-.06	-.05	.02	-.18**	.03	.02	.14*		
14.Independent IT Investment at the Target	-.08	-.01	-.18**	.08	.13+	.04	-.11+	-.10	.12	.01	-.07	-.14	-.00	
15.Transaction Type I (1 =acquiring from another multi-hospital system)	.08	-.06	.26**	.09	.30**	-.05	-.03	.23**	.28**	.02	-.12+	-.19**	-.12+	.15*
16 Transaction Type II (1 =acquiring another multi-hospital system)	-.13	-.05	-.11+	-.14*	-.58**	-.09	.15*	-.13**	-.26**	-.10	.23**	.54**	.15*	-.18**
17 Teaching Status of the Target (1 = teaching hospital)	-.05	-.03	.06	.16*	.09	.07	-.04	-.06	.16*	.06	-.05	-.13*	-.46**	.15*
18 Size of the Target	-.03	-.10	.16*	.17*	-.03	-.21**	.05	-.12+	.36**	.06	-.05	.07	-.12+	.11+
19 Age of the Target	-.03	-.05	.14*	.19**	.07	.20**	.09	-.08	-.05	.13+	-.00	-.25**	.07	.05
20 Book Leverage Ratio of the Target	-.14	-.05	.01	.14+	.22**	.16+	-.05	-.05	.09	-.02	-.05	-.27**	.02	.01
21 Financial Slack of the Target (1 = having positive net operating profit)	.09	.08	-.15+	-.12	-.17*	-.24**	.13	-.16*	.05	.02	-.08	.22**	-.06	-.04
22 Liquidity of the Target	.07	.17	.02	-.08	-.01	-.13	.02	-.07	-.07	.01	.05	.15+	-.05	-.07
23 For-Profit Status of the Acquirer (1 = for profit)	.06	-.08	-.11+	-.48**	-.24**	-.23**	.11+	.40**	-.14*	-.16*	.14*	.66**	.15*	-.11+
N	148	126	226	205	205	205	228	245	240	245	245	245	219	245
Mean	.10	-1.48	16.58	.56	-.45	.59	.16	.09	.11	.76	.06	1.07	-4.44	2.61
Standard Deviation	.07	13.95	16.49	.15	.41	.49	.21	.29	.21	.43	.24	1.30	47.34	6.51

Table 3 (Continued)

Variable	15	16	17	18	19	20	21	22	23
16Transaction Type II (1 =acquiring another multi-hospital system in entirety)	-.45**								
17Teaching Status of the Target (1 = teaching hospital)	.22**	-.12+							
18Size of the Target	.16*	.14*	.36**						
19Age of the Target	-.27**	-.18**	-.03	.02					
20Book Leverage Ratio of the Target	.20*	-.19*	.06	-.08	-.03				
21Financial Slack of the Target (1 = having positive net operating profit)	-.29**	.26**	.03	.15+	.05	-.31**			
22Liquidity of the Target	-.08	.15+	-.09	-.02	-.10	-.15+	.20*		
23For-Profit Status of the Acquirer (1 = for profit)	-.01	.33**	-.16*	-.05	-.27**	-.14+	.02	.10	
N	245	245	245	240	233	154	155	154	245
Mean	.36	.27	.04	135.25	18.26	.62	.50	2.55	.40
Standard Deviation	.48	.44	.19	117.79	28.16	.84	.50	3.39	.49

+: p<0.1; *: p<0.05; **, p<0.01; two-tailed t-test

MODEL SPECIFICATION

We employed seemingly uncorrelated regression (SUR) models to validate our hypotheses. The efficiency improvement and quality improvement of a hospital are likely to be simultaneously influenced by some unknown factors. By specifying an SUR model, we account for the correlation between the residuals of different regressions to improve the estimation efficiency (Greene 2002). Our SUR model is specified as follows:

$$\begin{cases} \mathrm{EFCImprv}_{t+3} = \beta_0 + \beta_1 \mathrm{DA}_{t+2} + \mathrm{Controls} + \varepsilon_1 \\ \mathrm{QULImprv}_{t+3} = \gamma_0 + \gamma_1 \mathrm{DA}_{t+2} + \mathrm{Controls} + \varepsilon_2 \\ \mathrm{DA}_{t+2} = \delta_0 + \delta_1 \mathrm{EXT}_{t-1} + \delta_2 \mathrm{RLD}_{t-1} + \delta_3 \mathrm{DG}_{t-1} + \delta_4 \mathrm{DG}_{t-1} \times \mathrm{EXT}_{t-1} \\ \qquad\qquad + \delta_5 \mathrm{DG}_{t-1} \times \mathrm{RLD}_{t-1} + \mathrm{Controls} + \varepsilon_3 \end{cases}$$

where $\boldsymbol{\beta}, \boldsymbol{\gamma}, and\ \boldsymbol{\delta}$ are coefficients to estimate, $\boldsymbol{\varepsilon_1}, \boldsymbol{\varepsilon_2},$ and $\boldsymbol{\varepsilon_3}$ are error terms of each equation, and t is the acquisition year. The other notations and the details of control variables can be found in Table 2.

Because one acquirer could make multiple transactions in our study timeframe, and multiple hospitals can be acquired in one transaction, we specified robust standard errors clustered on either acquirers or transactions and estimated the SUR models with maximum likelihood estimation (Gould et al. 2010). The results on our hypothesized relationships remain robust at the same significance levels under both specifications.

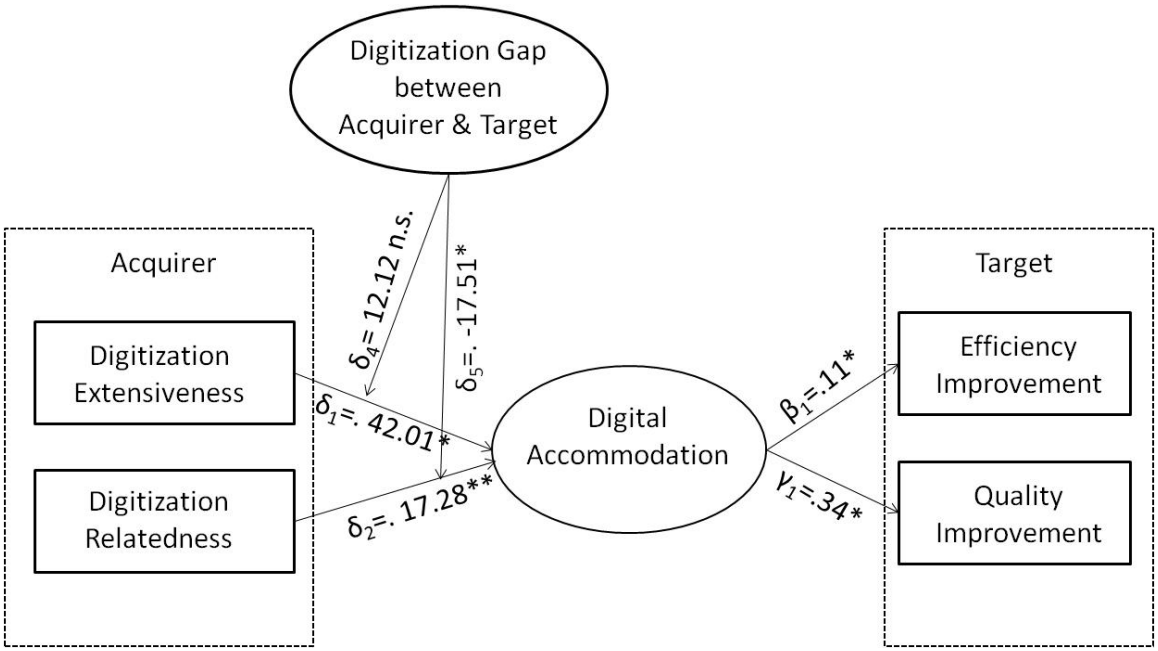
In addition, we explored whether digital accommodation is endogenous in the system of equations. The Durbin-Wu-Hausman (DWH) specification tests do not provide evidence that digital accommodation is endogenous in most of our model variants. When the error structure is specified as clustering on acquirers and digitization gap is measured as a continuous variable, DWH tests still provide no evidence that digital accommodation is endogenous in the quality improvement regression, and provide weak evidence that

digital accommodation could be endogenous in the efficiency improvement regression (p-value = .07). As a robustness check, we ran three-stage least square (3SLS) models to estimate the same system of equations under the latter clustered error structure. With this specification, Sargan-Hansen's over-identification test suggests that digitization extensiveness and relatedness serve as proper instrument variables for digital accommodation, and the results on our hypothesized relationships remain robust at the same significance levels. We reported the SUR results with robust standard errors clustered on transactions below.

CHAPTER 4: RESULTS

Table 4 and Figure 4 present results of the SUR models.

Figure 4: Visualized Regression Results



Notes: +: p<0.1;*: p<0.05;**: p<0.01; n.s.; not significant

Table 4: Process Digitization, Digital Accommodation, and Acquisition Performance

	Panel 1: Digitization Gap as a Dummy Var.			Panel 2: Digitization Gap as a Continuous Var.		
Variables	**Equation 1: Digital Accommodation**	**Equation 2: Efficiency Improvement**	**Equation 3: Quality Improvement**	**Equation 1: Digital Accommodation**	**Equation 2: Efficiency Improvement**	**Equation 3: Quality Improvement**
Independent Variable:						
Digital Accommodation (DA)		.11*	.34**		.12*	.41*
		(.05)	(.17)		(.05)	(.19)
Digitization Extensiveness (EXT)	42.01*			51.61**		
	(16.98)			(18.00)		
Digitization Relatedness (RLD)	17.28**			9.90**		
	(6.16)			(3.42)		
Digitization Gap (DG)	-14.73			-23.09		
	(9.91)			(20.89)		
DG x EXT	12.13			-6.25		
	(14.43)			(28.67)		
DG x RLD	-17.57*			-44.53*		
	(7.86)			(18.73)		
Control variable:						
IT Application	-8.99	-1.38	3.32	-9.47	-1.09	4.63
Similarity	(7.13)	(1.87)	(5.66)	(6.87)	(2.02)	(6.08)
Acquisition Experience	1.42	.24	.14	1.51	.31	.42
of the acquirer	(1.45)	(.32)	(1.05)	(1.66)	(.32)	(1.10)
For-profit Status	13.13 ***	-2.35	3.85	12.76 ***	-2.58+	2.83
Difference	(3.41)	(1.54)	(4.27)	(3.33)	(1.56)	(4.40)
Relative Size of the	-12.34	4.34**	6.99	-13.63	4.68**	8.47
Target to the Acquirer	(10.83)	(1.61)	(5.15)	(11.64)	(1.77)	(5.98)
Geographic Proximity	-.11	-1.29*	1.12	.26	-1.33*	.95
	(3.37)	(.60)	(1.32)	(3.40)	(.61)	(1.47)
Organizational	-6.85	.01	-1.06	-6.60 +	.03	-.92
Similarity	(3.82)	(.83)	(1.57)	(3.62)	(.82)	(1.64)
Expansion (Shrinkage)		.01+	.01		.01	-.002
of the Target		(.004)	(.01)		(.004)	(.01)
Independent IT		.02	.04		.02	.01
Investment at the Target		(.03)	(.06)		(.034)	(.06)
Transaction Type I		.96	-.61		1.04	-.32
		(.77)	(1.80)		(.76)	(1.84)
Transaction Type II		.25	-.84		.30	-.62
		(.84)	(2.97)		(.84)	(2.99)
Teaching Status of the		-2.65+	-2.04		-2.43+	-1.34
Target		(1.38)	(2.33)		(1.29)	(2.32)
Size of the Target		.01**	-.01		.01*	-.01
		(.002)	(.01)		(.002)	(.01)
Age of the Target		-.01	-.02		-.01	-.02
		(.01)	(.02)		(.01)	(.02)
Book Leverage Ratio of		-.23	-.14		-.23	-.15
the Target		(.38)	(.53)		(.36)	(.57)
Financial Slack of the		-.06	1.94		-.17	1.57
Target		(.56)	(1.31)		(.55)	(1.21)
Liquidity of the Target		-.03	-.04		-.03	-.04
		(.05)	(.08)		(.05)	(.08)

	Panel 1: Digitization Gap as a Dummy Var.			Panel 2: Digitization Gap as a Continuous Var.		
For-Profit Status of the		.45	.83		.35	.57
Acquirer		(.95)	(2.54)		(.92)	(2.53)
Year Dummy I (1 =		.84	1.51		.88	1.69
year 2007)		(.79)	(2.41)		(.79)	(2.37)
Year Dummy II (1 =		1.30	-.46		1.29+	-.49
year 2008)		(.80)	(1.33)		(.78)	(1.37)
Constant	2.22	-5.94***	1.83	-6.37	-6.14**	.74
	(8.94)	(1.65)	(4.73)	(12.13)	(1.69)	(5.12)
Number of observations	109			109		

REGRESSION RESULTS

We estimated two sets of SUR models as in the Panel 1 and 2 in Table 4. We report results when digitization gap is measured as a dummy variable in Panel 1 and digitization gap as a continuous variable in Panel 2.

As shown in the Equation 1 of the Panel 1, the two main effects of an acquirer's process digitization on digital accommodation are significant and positive. Then, in the Equation 2 and 3 in the Panel 1, digital accommodation has significant and positive effects on both efficiency and quality improvement of hospitals after they are acquired. Last, the interaction between digitization gap and an acquirer's digitization extensiveness is positive but not significant, while the interaction between digitization gap and an acquirer's digitization relatedness is negative and significant as expected. Overall, the results suggest that the extensiveness and relatedness of an acquirer's process digitization lead to a higher level of digital accommodation activities, which in turn improve the target's efficiency and quality. Thus, the results are consistent with H1a and H1b. Moreover, the relative gap between the target and the acquirer does not appear to significantly influence the effect of extensiveness on digital accommodation, but it does significantly influence the effect of relatedness on digital accommodation. The effect of relatedness will be attenuated when the acquirer is more digitized than the target. So, we found evidence to support our H2b but not H2a. Figure 4 reports the results of Panel 1.

MODERATION TEST

According to the Equation 1 of the Panel 1, when a target is less digitized, the effect of relatedness on digital accommodation turns slightly negative. This might be caused by the coarse-grained measurement of digitization gap. We further analyzed the moderation effects by using a continuous measure of digitization gap, and reported the results in Panel 2 of Table 4. Results on all the hypothesized relationships remain qualitatively the same. In addition, the continuous measure of digitization gap allowed us to further understand the moderating effects as we conducted further systematic analyses on the marginal effects as follows (Brambor et al. 2006; Spiller et al. 2013).

In Equation 1 of the Panel 2, the marginal effects of the digitization extensiveness and the relatedness are given by:

$$\begin{cases} \dfrac{\partial \mathbf{DA_{t+2}}}{\partial \mathbf{EXT_{t-1}}} = \boldsymbol{\delta_1} + \boldsymbol{\delta_4}\mathbf{DG_{t-1}} \\ \dfrac{\partial \mathbf{DA_{t+2}}}{\partial \mathbf{RLD_{t-1}}} = \boldsymbol{\delta_2} + \boldsymbol{\delta_4}\mathbf{DG_{t-1}} \end{cases}$$

where the notations are defined in the SUR models and Table 2.

The significance of these first marginal effect will be determined by the variance of δ_1 and δ_4, the covariance between them, and the level of $\mathbf{DG_{t-1}}$. We conducted Wald tests with the null hypotheses that $\mathbf{H0}$: $\boldsymbol{\delta_1} + \boldsymbol{\delta_4}\mathbf{DG_{t-1}} = \mathbf{0}$ under all the observed values[5] of $\mathbf{DG_{t-1}}$ and then plotted the estimated value of marginal effects and their corresponding corresponding p-values for the Wald tests as the Figure 5-1 below. Similarly, we plotted the same chart for the second marginal effect as the Figure 5-2.

[5] In Spiller and his colleagues (2013) 's terminology, we conducted "floodlight" rather than "spotlight" moderation tests in this study. A "spotlight" test examines the hypothesized relationship only at selected "spots" of the moderating variable, usually at its mean and one standard deviation up and down the mean. A "floodlight" test instead examines the hypothesized relationship at a flow of focal values of the moderating variable.

Figure 5: Marginal Effects of Acquirer's Process Digitization on Digital Accommodation Levels

Figure 5-1: Digitization Extensiveness

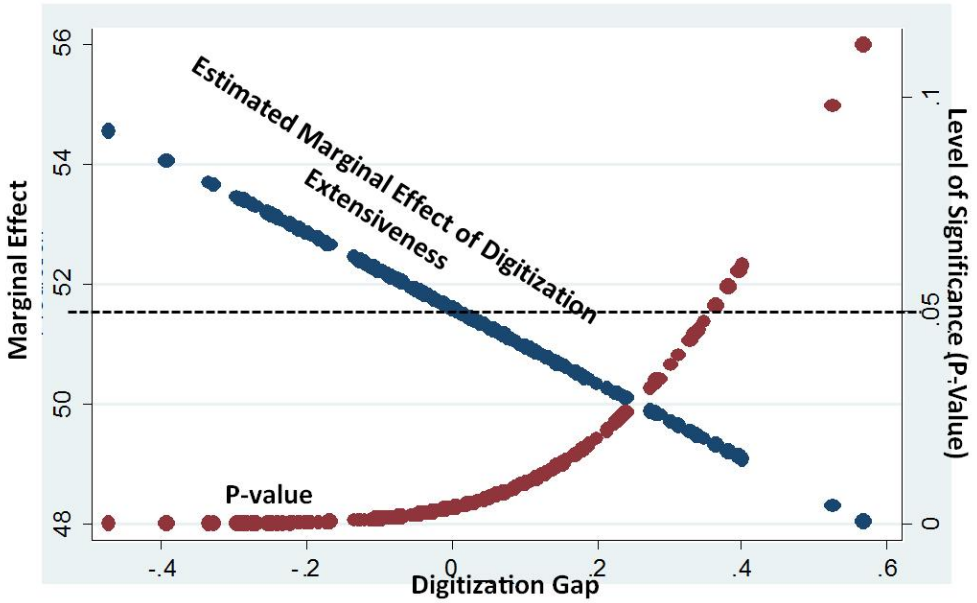
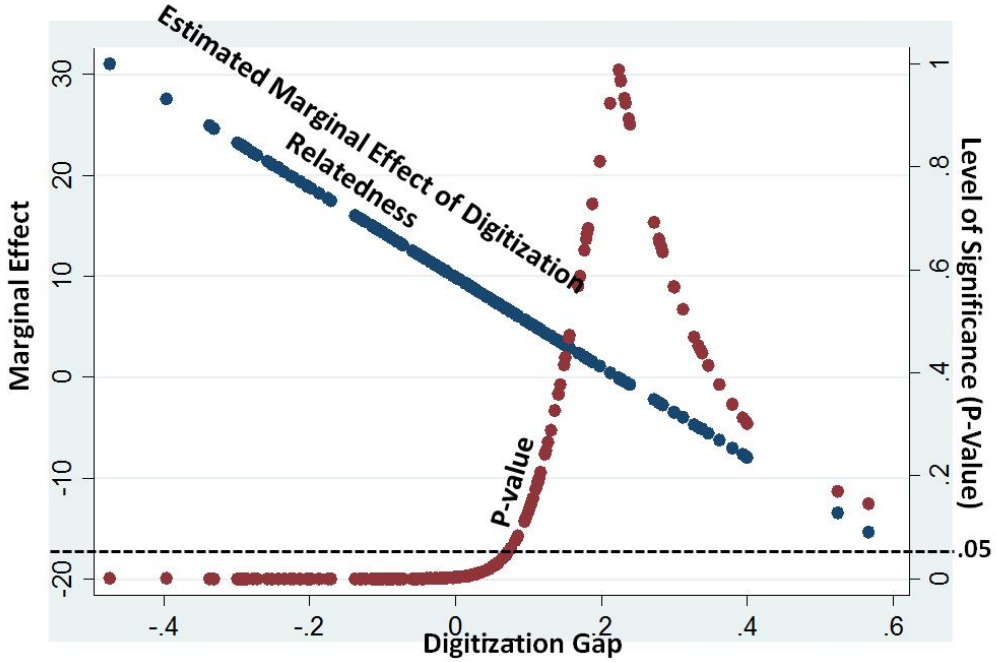


Figure 5-2: Digitization Relatedness



In the Figure 5-1, except for a few conditions in which the digitization gap between the acquirer and the target is extremely high, the marginal effects of digitization extensiveness are significant and positive at the .05 level, suggesting that digitization extensiveness will have a positive effect on digital accommodation regardless of the level of digitization gap. However, because the coefficient of the interaction in Equation 1 of Panel 2 is not significant, we cannot conclude with confidence that, for a level of digitization extensiveness, the influence on digital accommodation will be higher when the level of digitization gap is high. Alternatively speaking, we cannot conclude that the slope of the line in Figure 5-1 is upwards. So, overall, we still do not have conclusive evidence to support H2a.

The Figure 5-2 reveals more insights on the interaction between digitization relatedness and digitization gap. The influence of digitization relatedness on digital accommodation is significant mostly when the digitization gap is negative, meaning that the target has a higher level of digitization than the acquirer. First, the marginal effects of digitization relatedness remain positive when they are statistically significant, which suggests that digitization relatedness itself will have a positive effect on digital accommodation as long as the digitization gap is in the certain range from being negative to being slightly positive. Then, the coefficient of the interaction in Equation 1 of Panel 2 is significant but negative, so we can statistically conclude that the slope of the line in Figure 5-1 is downwards. However the negative interaction, or the attenuating effect of digitization gap, surface mostly when the target is more digitized than the acquirer, otherwise digitization relatedness does not significantly influence digital accommodation. So, in summary, an acquirer's digitization relatedness affects digital accommodation mostly when the digitization level of the target exceeds the level of the acquirer. In this scenario, the larger the absolute value of the gap, the stronger the effect of digitization

relatedness on digital accommodation. Otherwise digitization relatedness does not appear to be an influential determinant to digital accommodation. So, overall, our results are consistent with H2b.

MEDIATION TEST

Our overall conceptual model can be considered as a mediated moderation model (Muller et al. 2005). Table 5 below summarizes the mediation effects implied in our model and their significance tests, where the notations are defined above in the SUR models. We use the continuous measure of digitization gap in the mediation test to capture and report more variance of the mediation effects.

Table 5: Mediation Tests

	Relationship	**Null Hypothesis**	**Wald χ^2 Statistics**
When Digitization Gap is zero	$EXT_{t-1} \rightarrow DA_{t+2} \rightarrow EFCImprv_{t+3}$	$\delta_1 \times \beta_1 = 0$	5.63*
	$EXT_{t-1} \rightarrow DA_{t+2} \rightarrow QULImprv_{t+3}$	$\delta_1 \times \gamma_1 = 0$	7.57**
	$RLD_{t-1} \rightarrow DA_{t+2} \rightarrow EFCImprv_{t+3}$	$\delta_2 \times \beta_1 = 0$	4.15*
	$RLD_{t-1} \rightarrow DA_{t+2} \rightarrow QULImprv_{t+3}$	$\delta_2 \times \gamma_1 = 0$	3.79+
When Digitization Gap is non-zero	EXT_{t-1}+ EXT_{t-1}* DG_{t-1} $\rightarrow DA_{t+2} \rightarrow EFCImprv_{t+3}$	$(\delta_1 + \delta_4 \times DG_{t-1}) \times \beta_1 = 0$	Significant at .05 level for 93% of the observed digitization gap levels (unless DG_{t-1}>.312)
	EXT_{t-1}+ EXT_{t-1}* DG_{t-1} $\rightarrow DA_{t+2} \rightarrow QULImprv_{t+3}$	$(\delta_1 + \delta_4 \times DG_{t-1}) \times \gamma_1 = 0$	Significant at .05 level for all observed digitization gap levels
	RLD_{t-1}+ RLD_{t-1}* DG_{t-1} $\rightarrow DA_{t+2} \rightarrow EFCImprv_{t+3}$	$(\delta_2 + \delta_5 \times DG_{t-1}) \times \beta_1 = 0$	Significant at .05 level for all observed negative levels of digitization gaps and a few slightly positive ones (when DG_{t-1}<.018)
	RLD_{t-1}+ RLD_{t-1}* DG_{t-1}	$(\delta_2 + \delta_5 \times$	Significant at .05 level

	$\rightarrow DA_{t+2} \rightarrow QULImprv_{t+3}$	$DG_{t-1}) \times \gamma_1 = 0$	for all observed negative levels of digitization gaps and a few slightly positive ones(when DG_{t-1} <.003)

Notes: *: p<0.05; **: p<0.01; Wald χ^2 test with the degree of freedom is 1.

In conducting the mediation tests in Table 5, we adopt the classic definitions of mediation effect recommended by Baron and Kenny (1986) as the product of effect sizes between an independent variable and a mediator and between a mediator and an dependent variable. We then followed the updated mediation test procedures suggested by Edwards and Lambert (2007) and Rucker and his colleagues (2011). We first tested the mediation effect without the moderator present and then tested the mediated moderating effect6. Results are summarized in Table 5 and more details are reported in Figure 6 below. To summarize these results, the mediation effects are significant in most cases as long as the effects of digitization on accommodation are significant, which provide further support of our H1a and H1b.

[6] Differing from Baron and Kenny (1986)'s original recommendations, Rucker and his colleagues (2011) recently concluded that *"the focus on the significance between the independent and dependent variables, both before and after mediation tests, is unjustified and can impair theory development and testing"*(pp.359). We follow their suggestions to focus only on the magnitude and significance of indirect effects in our analysis.

Figure 6: Visualized Results for Mediation Tests

Figure 6.1 Digitization Extensiveness and Efficiency Improvement

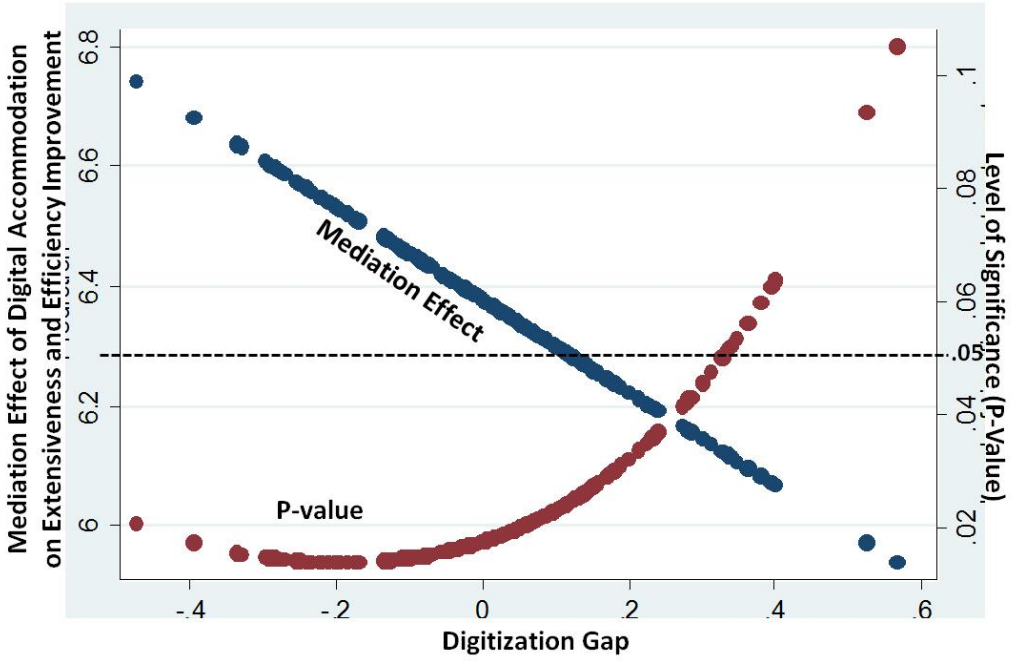


Figure 6.2 Digitization Extensiveness and Quality Improvement

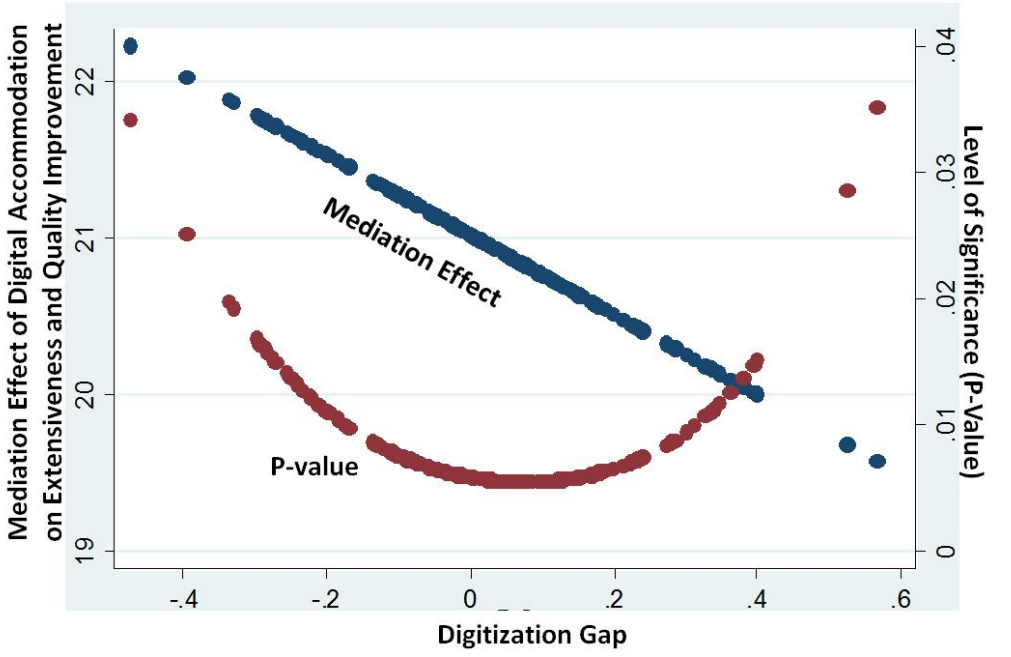


Figure 6.3 Digitization Relatedness and Efficiency Improvement

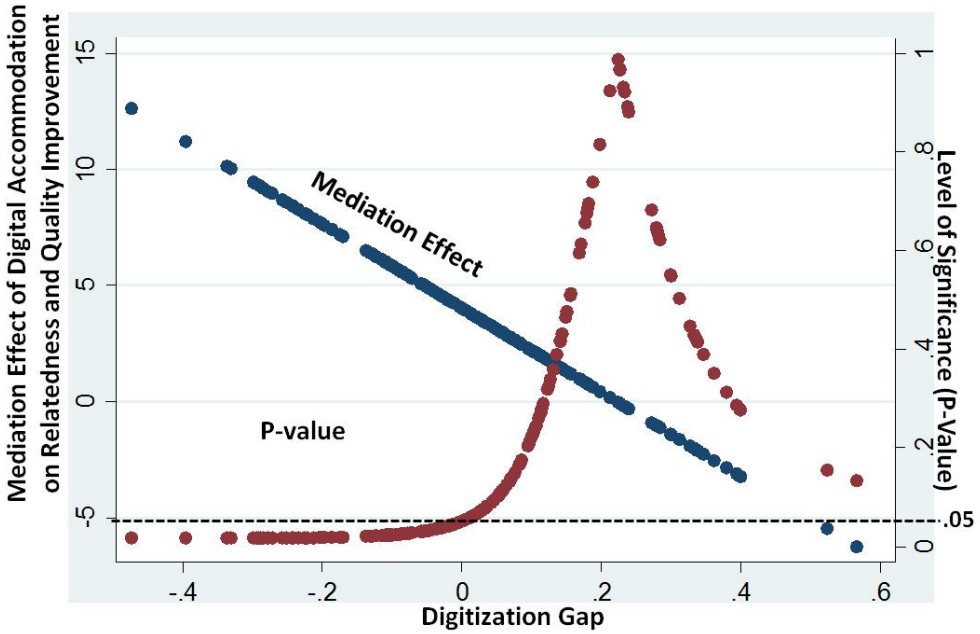
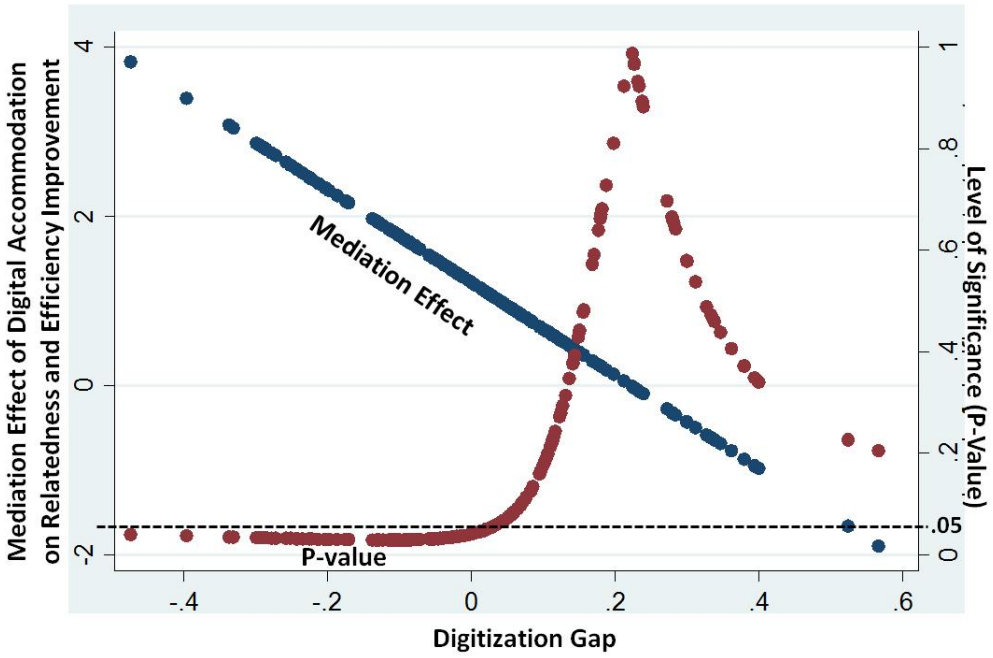


Figure 6.4 Digitization Relatedness and Quality Improvement



FURTHER DISCUSSION

We further explored the possible explanations for the non-supported hypothesis H2a. The digitalization gap does not significantly moderate the relationships between the acquirer's digitization extensiveness and its subsequent digital accommodation decision. So, the results suggest that regardless of the digitization gap, acquirers with extensive process digitization will always attempt to accommodate their targets with their digitized processes, ignoring whether the targets have or have not already accomplished extensive digitization by itself. This might reflect the political power argument provided by Mehta and Hirschheim (2007) that acquisition integration decisions often reflect the "*acquirer's way*". However, we also offer an alternative explanation as follows. Prior to an acquisition, the target may choose its previous digitization approaches to optimize its existing operations. After the acquisition, these approaches may not suit the new operating environments. For example, large and complex organizations usually have more strict criteria with respect to reliability, security and responsiveness of their IT systems and business processes. Many of the target's IT resources have to be replaced so as to conform to the acquirer's standards, so the impact of high digitization extensiveness on digital accommodation appears to not be conditional on the digitization gap. Due to data availability constraints, we inferred digitization gap only by the existence or absence of an IT application to support a function rather than the quality of the application installed or the effectiveness of its usage, so our unsupported results may be an artifact that we cannot measure digitization gap based on the effectiveness of IT applications.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

Our research question is how information technology helps acquirers to improve the performance of their acquisition targets. In answering it, this study proposes and empirically validates a nomological network that links acquirers' and targets' pre-acquisition conditions, acquisition integration activities, and acquisition outcomes. As our results show, a higher level of digital accommodation improves the operational performance of a target, and the higher the extensiveness and relatedness of an acquirer's process digitization, the more the acquirer is likely to pursue a high level of digital accommodation. In addition, the study articulates digitization extensiveness and relatedness as two precedents to enable the creation of acquisition value. Digitization extensiveness represents the strength of an acquirer's digital resource base that can be provided to fill the resource gap of a target, a mechanism we call digitization-revitalization. While digitization relatedness represents the strength of an acquirer's digital resource base that can be leveraged in support of integrating targets with existing business units to unlock synergies, a mechanism we call integration-synergy-creation. Moreover, while an acquirer can leverage both sources of parenting advantage through digital accommodation, the digitization gap between the acquirer and its target appears as a contingency factor. The first, digitization-revitalization approach appears to be pursued in most acquisitions, while the second, integration-synergy-creation approach, which demands a related resource base of the acquirer, will be separately pursued only when the target itself already has a strong resource base and revitalization opportunities are limited.

IMPLICATIONS FOR THEORY

This dissertation contributes to the growing but yet limited literature on IT in acquisitions. Despite the increasing strategic importance of IT in acquisitions (Sarrazin

and West 2011), academic studies on the role of IT in acquisitions remain relatively at a tactical level. The majority of studies in this literature focus on the post-acquisition IT decisions, with only a few exceptions (Benitez-Amado and Ray 2012; Tanriverdi and Uysal 2011; Tanriverdi and Uysal Forthcoming) that investigate IT's performance impact at all. This dissertation outlines a comprehensive model that encompasses acquirers' IT resource and capability base as sources of acquisition value potential, digital accommodation as an acquisition value creation mechanism, and digitization gap as a contingency. Then, we develop our theory that links all these factors to the realization of acquirers' parenting advantage. To our knowledge, this research is among the first to integrate all these relevant IT constructs in a single theoretical framework.

In addition, this study offers an example of how IT can take a proactive rather than reactive role in acquisition value creation. Both Merali and McKiernan (1993) and Henningsson and Carlsson (2011) discussed these two different roles of IT in acquisitions, but did not fully elaborate the proactive role. With a reactive role, IT functions as a facilitator for other organizational changes. For example, acquirers may choose to integrate IT systems in order to realize certain desired business integration objectives such as product bundling and cross-selling, back office function consolidation, or vertical integration along the supply chain. In this scenario, post-acquisition IT decisions reflect business decisions (Henningsson and Carlsson 2011; Merali and McKiernan 1993), and the key success factor is IT-business alignment (Mehta and Hirschheim 2007; Wijnhoven et al. 2006). Even with a reactive role, IT is important for acquisitions to create value (Sarrazin and West 2011). However, this role somewhat limits the involvement of IT executives during the planning and decision-making phase of an acquisition (Merali and McKiernan 1993). Our study discusses mechanisms whereby the IT unit plays a proactive role in value creation. In our theory, properly

accommodating targets with acquirers' digitized resources is the ultimate objective. So, our research will enrich our understandings on the roles of IT in acquisitions.

Beyond the acquisition context, this research also contributes to the information systems literature in general. Information system scholars have focused on how IT creates business value in decades (for recent reviews, see Drnevich and Croson 2013; Kohli and Grover 2008). First, our study extends this literature stream to the acquisition context by showing how IT creates acquisition value. Moreover, our research implicitly raises and answers an important question: assuming that some organizations have built superior, IT-enabled resources and create competitive advantages, can they better exploit them beyond regular operations, and if so, what are the proper exploitation activities? Digitization extensiveness and digitization relatedness are rooted in the literature streams on business value of IT and IT integration, but our study further shows that they could also induce parenting advantage in corporate acquisition markets. With proper digital accommodation activities, firms can create more value from their IT investments by reusing them during acquisitions.

This study also contributes to the acquisition literature in general. Despite much research in several disciplines on acquisitions, the mechanisms shaping acquisition performance remain largely unclear (Haleblian et al. 2009; King et al. 2004). Many earlier acquisition studies focus on transaction-specific characteristics in explaining acquisition performance. As a result, the question rises as to why some firms appear to be better acquirers ex ante. Some researchers have taken the perspective of organizational learning and dynamic capabilities. They argue that the serial acquirers can build acquisition capabilities by learning from past acquisition experiences or from observing others acquisition experiences (Barkema and Schijven 2008a). Barkema and Chijven (2008a) note that acquisitions are far more complex than operational activities and each

acquisition is unique, so building an acquisition capability through learning is hard, and *"researchers are only just beginning to understand how these difficulties can be alleviated."* (Barkema and Schijven 2008a, pp.595). Our paper instead suggests a different angle. Although acquisition capabilities remain important, the strength of acquirers' existing resource stock is another factor that differentiates successful and non-successful acquirers. In this sense, we are introducing a resource readiness perspective to acquisition performance beyond the acquisition capability perspective. Organizational learning remains important in our theory, but it is no longer only about learning acquisitions from acquisitions. Instead, we suggest that acquirers can reuse their learning from experiences in regular operations to acquisitions. As articulated as the micro-foundation of dynamic capabilities (Teece 2007), a so-called acquisition capability consists of many routines that complete various subtasks in an acquisition. Many of these atomic level routines can be learned and formed during ordinary operations (Salvato 2009). In our study, acquirers can leverage and benefit from their experiences of regular process digitization activities that are not intentionally designed and executed for acquisition preparation purposes. So, our study offers some evidence that acquisition capabilities, as a typical dynamic capability, can be formed in regular operations, which can deepen our understanding on the micro-foundation of dynamic capabilities.

Another one of the potential issues in acquisition research so far could be the locus of analyses. With a few exceptions (e.g., Paruchuri et al. 2006), acquisition studies focus on the performance of the combined entity after the transaction. Without separating the performance impacts on targets and other units, many of the theoretical arguments cannot be tested directly. By tracking the changes in targets' IT and the performance before and after acquisitions, this paper contributes to the acquisition literature by directly investigating how acquirers can enhance resource utilization at

targets. Without disagreeing that leveraging the acquired resources to improve acquirers' performance is also important, we believe that showing how acquirers can bring parenting advantage enriches our understanding on acquisition value creation. Thus, the research provides an important complement to the existing acquisition research that has mainly focused on acquirers' performance.

However, the boundary conditions of our theory need to be pointed out. Our theoretical premise is that acquisitions happen when opportunities emerge for acquirers to take over and improve other businesses as bundles of under-utilized resources. However, not all acquisitions are driven by resource utilization enhancement considerations. For example, behavioral researchers have revealed that irrational acquisition decisions can be made due to agency issues or management hubris in acquirers (e.g., Hayward and Hambrick 1997). Industrial organization economists have traditionally focused on acquisitions as a means to increase market power, pre-empt competition, or bypass entry barriers (e.g., Grimpe and Hussinger 2008). Moreover, in some other acquisitions, acquirers dissolve targets completely and only selectively retain acquired resources. Our theory applies only when targets keep continuous operation after the transaction, and it also assumes acquirers' value-creation intent. Consistent with these boundary conditions, we focus on the improvement of targets' operational performance, but our theory could be stronger if we were able to directly control for acquirers' intents when making their acquisition decisions.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

One limitation of this study is the coarse-grained measures of process digitization. From our archival dataset, we are only able to observe the variance in IT application adoption but not the actual usage, so our measures do not capture different levels of

effectiveness of these applications in use. Related to this limitation, we are not able to observe other resources complementary to IT applications in use such as IT infrastructure, data, users, and policies and processes of using these applications. Process digitization will create a system of inter-related IT and business resources (Nevo and Wade 2010), but due to data availability constraints, our measures do not capture the non-IT resources complementary to IT resources. These limitations prevent us from accurately measuring our major constructs and probably lead to the unsupported hypothesis H2a.

Our theory is tested based same-industry acquisitions. Future studies could adapt and validate the theory and hypotheses of this paper in acquisitions in which acquirers and targets are relatively unrelated. The scope of digitized processes applicable in accommodating unrelated acquisitions will be certainly narrower in contrast to same-industry acquisitions. The extent of unrelatedness between acquirers and targets may thus influence the applicability of acquirers' digitized processes to serve targets' operations. However, acquirers in unrelated acquisitions still need to justify their parenting advantage by showing that targets are better off as their subsidiaries rather than independent firms. For example, in the case of technology acquisitions, small start-up companies may have the cutting-edge innovations, but they often face challenges in commercializing their innovations or scaling up their operations to serve maximum possible markets. Then they often become acquisition candidates to incumbents with larger size and more mature operations because these incumbents can provide the competitive necessities such as process digitization in order for these innovations to scale up rapidly. We could learn more about the business implications of process digitization in general by studying whether and how diversified firms leverage their process digitization in acquisitions.

Our study also calls for a shift in the research attention of IT strategists. After decades of process and capability digitization, firms are realizing that enterprise applications are turning into a competitive necessity. The research focus of enterprise IT is shifting from efficiency and productivity to competitive agility and capability-enabling (e.g., Chi et al. 2010; Lu and Ramamurthy 2011; Sambamurthy et al. 2003). The shift largely reflects a secondary effect of enterprise applications, in the sense that while they replace manual processes and improve efficiency, their rigidity and complexity hinder firms from making necessary changes and launching new strategic actions (Rettig 2007). Existing studies have focused on the agility issues from both architecture (Ross 2003; Tiwana and Konsynski 2010) and capability (Pavlou and El Sawy 2006; Pavlou and El Sawy 2010) perspectives. However, agility, as in these studies, usually entails making only incremental adjustments to the resource bases while the business positioning is given. If a firm needs to completely overhaul its business in a strategic renewal or to reposition itself in the business landscape through corporate transactions, it needs agility at the level of the corporate business portfolio. Many related issues have not been adequately explored such as how enterprise IT can create business value during corporate restructurings, how enterprise IT can be architected and IT capabilities can be accumulated to enable agility at the business portfolio level, and how IT can be aligned to corporate strategies (Tanriverdi et al. 2010). While this study takes a small step ahead by investigating how IT can prepare firms for acquisitions, future studies could follow the above questions to study the role of IT during dramatic corporate restructuring events.

Appendix 1: Quality Indicators of Healthcare Delivery Process at Hospitals

INTRODUCTION

Hospital Compare is a nation-wide public reporting program for quality measures of hospitals, also developed by the CMS and its various collaborators as part of its Hospital Quality Initiative. The most updated hospital compare datasets consist of a variety of process-of-care and outcome-of-care quality scores. We choose to use process-of-care quality due to both data availability constraints in our study timeframe and also the fact that process-of-care is more directly under the control of hospitals. The outcome-of-care quality measures are briefly discussed in the end of this appendix.

Overall, the process-of-care quality indicators reflect both the timeliness with which hospitals treat patients and their compliance with commonly accepted standards of care, based on current scientific evidence. The specific indicators of process-of-care have been selected "*represent wide agreement from CMS, the hospital industry and public sector stakeholders such as The Joint Commission (TJC), the National Quality Forum (NQF), and the Agency for Healthcare Research and Quality (AHRQ), and hospital industry leaders,*[7]*"* as explained in the manual. The representativeness of these quality indicators is thus ensured. The data for these indicators are collected based on the submission made by hospitals to "*the QIO Clinical Data Warehouse through the CMS Abstraction and Reporting Tool (CART) or vendors*[8]*.*"

In processing this dataset, one needs to take meticulous care on the difference between data collection period and data reporting period. For example, data for a quality

[7] http://www.hospitalcompare.hhs.gov/Data/AboutData/Measures-Selected.aspx, accessed in November 30, 2012

[8] http://www.hospitalcompare.hhs.gov/Data/AboutData/Data-Sources.aspx, accessed in November 30, 2012

indicator reported in September 2009 reflects the operations of hospitals between January 2008 and December 2008. Detailed data collection periods are usually documented and reported along with each data release. For our research purpose, we utilized the data collection periods to decide the quality measures of a hospital before and after an acquisition.

QUALITY INDICATORS USED IN THE CALCULATION

Table 6: Process-of-Care Quality Indicators

Condition	Quality Indicator
Acute Myocardial Infarction	Patients Given Aspirin at Arrival
Acute Myocardial Infarction	Patients Given Aspirin at Discharge
Acute Myocardial Infarction	Patients Given ACE Inhibitor or ARB for Left Ventricular Systolic Dysfunction (LVSD)
Acute Myocardial Infarction	Patients Given Smoking Cessation Advice/Counseling
Acute Myocardial Infarction	Patients Given Beta Blocker at Discharge
Acute Myocardial Infarction	Patients Given Beta Blocker at Arrival
Acute Myocardial Infarction	Patients Given Fibrinolytic Medication Within 30 Minutes Of Arrival
Acute Myocardial Infarction	Patients Given PCI Within 90 Minutes Of Arrival
Heart Failure	Patients Given Discharge Instructions
Heart Failure	Patients Given An Evaluation of Left Ventricular Systolic (LVS) Function
Heart Failure	Patients Given ACE Inhibitor or ARB for Left Ventricular Systolic Dysfunction (LVSD)
Heart Failure	Patients Given Smoking Cessation Advice/Counseling
Pneumonia	Patients Given Oxygenation Assessment
Pneumonia	Patients Assessed and Given Pneumococcal Vaccination

Pneumonia	Patients Whose Initial Emergency Room Blood Culture Was Performed Prior to the Administration of the First Hospital Dose of Antibiotics
Pneumonia	Patients Given Smoking Cessation Advice/Counseling
Pneumonia	Patients Given Initial Antibiotic(s) within 4 Hours After Arrival
Pneumonia	Patients Given the Most Appropriate Initial Antibiotic(s)
Surgical Care Improvement/ Surgical Infection Prevention	Surgery Patients Who Received Preventative Antibiotic(s) One Hour Before Incision
Surgical Care Improvement/ Surgical Infection Prevention	Surgery Patients Whose Preventative Antibiotic(s) are Stopped Within 24 hours After Surgery

OUTCOME-OF-CARE QUALITY MEASURES

Hospital Compare covers two outcome-of-care quality measures: 30-day mortality rate and 30-day readmission rate for patients with three types of diseases including Heart Attack, Heart Failure, and Pneumonia. Hospital Compare started to report 30-day mortality rate in 2008, and 30-day readmission rate in 2009. Our study cannot leverage these outcome-of-care quality data because our dependent variable requires performance data one year prior to and three years after an acquisition. Moreover, we consider that process-of-care quality will better reflect hospitals' operational performance because care delivery processes are under hospitals' direct control, while outcomes of care also depend on other factors such as patients' and clinician' conditions.

Nevertheless, we explored the correlations between process-of-care and outcome-of-care quality measures when data availability allows. The two are significantly correlated such that high process-of-care quality is associated with lower mortality or readmission rates. The correlation results are reported below.

Table 7: Correlations Between Process-of-Care and Outcome-of-Care Quality Measures

	30-day Mortality Rate	**30-day Readmission Rate**
For Heart Attack Patients		
Process-of-Care Quality	-.106***	-.120***
For Heart Failure Patients		
Process-of-Care Quality	-.045***	-.081***
For Pneumonia Patients		
Process-of-Care Quality	-.056***	-.091***

Notes: *: $p < .001$;

Appendix 2: Functions and IT Applications Utilized in Constructing a Hospital's Digitization Profile

INTRODUCTION

The HIMSS Analytics (HA) Database tracks, in addition to other information, the IT usage status of over 120 administrative and clinical functions for about 5000 U.S. hospitals in its most recent annual release. For each function, the HA database reports its status of such function as "Not Reported", "Service Not Provided", "Not Automated", "[software application] Contracted/Not Yet Installed", "[software application] Installation in Process" "[software application] Live and Operational", and "[software application] To Be Replaced." Then, for those functions with software applications in place, the HA database reports their software vendors and the specific software products. In calculation, we consider the "Live and Operational" or "To be Replaced" status of a function as indicators that this function has been digitized, "Not Reported" as missing data, "Service Not Provided" as a function inapplicable to this hospital, while others as a function provided but not digitized yet in this hospital.

FUNCTIONS UTILIZED IN CONSTRUCTING A HOSPITAL'S DIGITIZATION PROFILE

Table 8: Functions Used in Constructing a Hospital's Digitization Profile

#	Category	Function/IT Application		#	Category	Function/IT Application
1	ED/Operating Room/Respiratory	Emergency Department (ED) Information System		37	Financial Decision Support	Business Intelligence
2	ED/Operating Room/Respiratory	Operating Room (Surgery) - Peri-Operative		38	Financial Decision Support	Financial Modeling
3	ED/Operating Room/Respiratory	Operating Room (Surgery) - Post-Operative		39	Financial Decision Support	Budgeting

4	ED/Operating Room/Respiratory	Operating Room (Surgery) - Pre-Operative		40	Financial Decision Support	Contract Management
5	ED/Operating Room/Respiratory	Respiratory Care Information System		41	Financial Decision Support	Cost Accounting
6	Electronic Medical Record	Clinical Data Repository		42	Financial Decision Support	Data Warehousing/ Mining - Financial
7	Electronic Medical Record	Clinical Decision Support System		43	Financial Decision Support	Executive Information System
8	Electronic Medical Record	Computerized Practitioner Order Entry		44	Human Resources	Personnel Management
9	Electronic Medical Record	Order Entry (Includes Order Communications)		45	Human Resources	Benefits Administration
10	Electronic Medical Record	Physician Documentation		46	Human Resources	Time and Attendance
11	Laboratory	Blood Bank		47	Human Resources	Payroll
12	Laboratory	Anatomical Pathology		48	General Financials	General Ledger
13	Laboratory	Microbiology		49	General Financials	Accounts Payable
14	Laboratory	Laboratory Information System		50	Revenue Cycle Management	Enterprise Master Person Index
15	Radiology & PACS	Radiology Information System		51	Revenue Cycle Management	Patient Billing
16	Radiology & PACS	Radiology - Angiography		52	Revenue Cycle Management	Patient Scheduling
17	Radiology & PACS	Radiology - CR (Computed Radiography)		53	Revenue Cycle Management	Electronic Data Interchange (EDI) - Clearing House Vendor
18	Radiology & PACS	Radiology - CT (Computerized Tomography)		54	Revenue Cycle Management	Credit/Collections
19	Radiology & PACS	Radiology - DF (Digital Fluoroscopy)		55	Revenue Cycle Management	ADT/Registration
20	Radiology & PACS	Radiology - Digital Mammography		56	Supply Chain Management	Enterprise Resource Planning
21	Radiology & PACS	Radiology - MRI (Magnetic Resonance Imaging)		57	Supply Chain Management	Materials Management
22	Radiology & PACS	Radiology - Nuclear Medicine		58	Utilization Review/ Risk Management	Case Mix Management
23	Radiology & PACS	Radiology - US (Ultrasound)		59	Utilization Review/ Risk	Data Warehousing/Mining -

					Management	Clinical
24	Cardiology & PACS	Cardiology - Cath Lab		60	Utilization Review/ Risk Management	Outcomes and Quality Management
25	Cardiology & PACS	Cardiology - CT (Computerized Tomography)		61	Transcription	In-House Transcription
26	Cardiology & PACS	Cardiology - Echocardiology		62	Nursing	Intensive Care
27	Cardiology & PACS	Cardiology - Intravascular Ultrasound		63	Nursing	Obstetrical Systems (Labor and Delivery)
28	Cardiology & PACS	Cardiology - Nuclear Cardiology		64	Nursing	Nursing Documentation
29	Cardiology & PACS	Cardiology Information System		65	Nursing	RFID - Patient Tracking
30	Cardiology & PACS	Cardiology - Cath Lab		66	Nursing	Nurse Acuity
31	Health Information Management	Dictation		67	Nursing	Nurse Staffing/Scheduling
32	Health Information Management	Dictation with Speech Recognition		68	Nursing	Electronic Medication Administration Record
33	Health Information Management	Encoder		69	Nursing	Staff Scheduling
34	Health Information Management	Chart Deficiency		70	Pharmacy	Pharmacy Management System
35	Health Information Management	Chart Tracking/Locator				
36	Health Information Management	Abstracting				

EXEMPLARY DIGITIZATION PROFILES

Figure 7: Exemplary Digitization Profiles

Hospital ID: 123457

Hospital Name: BCD Hospital

Parent Organization: ABC Hospital System

Function ID	Function	Digitization Status	Software Used
#1	Emergency Department (ED) Information System	Digitized (Live and Operational)	HeathConnect
#2	Operating Room (Surgery) - Peri-Operative	Digitized (Live and Operational)	Millennium
#3	Operating Room (Surgery) - Post-Operative	Digitized (Live and Operational)	HMSMonitor
#4	Operating Room (Surgery) - Pre-Operative	Not-Digitized	N/A
#5	Respiratory Care Information System	Digitized (Live and Operational)	ClinVison
...	...	...	...

Hospital ID: 123456

Hospital Name: XYZ Hospital

Parent Organization: ABC Hospital System

Function ID	Function	Digitization Status	Software Used
#1	Emergency Department (ED) Information System	Digitized (Live and Operational)	OnTrack
#2	Operating Room (Surgery) - Peri-Operative	Digitized (Live and Operational)	Surginet
#3	Operating Room (Surgery) - Post-Operative	Not-Digitized	N/A
#4	Operating Room (Surgery) - Pre-Operative	Not-Digitized	N/A
#5	Respiratory Care Information System	N/A (Service not provided)	N/A
...	...	...	...

REFERENCE

Agarwal, R., Gao, G., DesRoches, C., and Jha, A.K. "The Digital Transformation of Healthcare: Current Status and the Road Ahead," *Information Systems Research* (21:4), December 2010, pp 796-809.

Angst, C.M., Agarwal, R., Sambamurthy, V., and Kelley, K. "Social Contagion and Information Technology Diffusion: The Adoption of Electronic Medical Records in U.S. Hospitals," *Management Science* (56:8), August 2010, pp 1219–1241.

Baldwin, C.Y., and Woodard, C.J. "The Architecture of Platforms: A Unified View," in: *Platforms, Markets and Innovation,* A. Gawer (ed.), Edward Elgar, Cheltenham, UK, 2009.

Barkema, H.G., and Schijven, M. "How Do Firms Learn to Make Acquisitions? A Review of Past Research and an Agenda for the Future," *Journal of Management* (34:3) 2008a, pp 594-634.

Barkema, H.G., and Schijven, M. "Toward Unlocking the Full Potential of Acquisitions: The Role of Organizational Restructuring," *Academy of Management Journal* (51:4) 2008b, pp 696-722.

Baron, R.M., and Kenny, D.A. "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Journal of Personality and Social Psychology* (51:6) 1986, pp 1173-1182.

Benitez-Amado, J., and Ray, G. "Introducing IT-Enabled Business Flexibility and IT Integration in the Acquirer's M&A Performance Equation," Proceedings of the Thirty Third International Conference on Information Systems (ICIS), Orlando, FL, 2012.

Beteze, P. "Executive Summary: Growth, Scale, Trump Independence," in: *Healthleaders Media Breakthroughs: Hospital Merger and Acquisition Strategies*, PriceWaterhouseCoopers, 2010.

Boh, W.F., and Yellin, D. "Using Enterprise Architecture Standards in Managing Information Technology," *Journal of Management Information Systems* (23:3) 2006, pp 163-207.

Brambor, T., Clark, W.R., and Golder, M. "Understanding Interaction Models: Improving Empirical Analyses," *Political Analysis* (14:1) 2006, pp 63-82.

Broadbent, M., Weill, P., and St.Clair, D. "The Implications of Information Technology Infrastructure for Business Process Redesign.," *MIS Quarterly* (23:2), June 1999, pp 159-182.

Brown, T.J., Werling, K.A., Walker, B.C., Burgdorfer, R.J., and Shields, J.J. "Current Trends in Hospital Mergers and Acquisitions," *Healthcare Financial Management* (66:3) 2012, pp 114-120.

Bryce, D.J., and Winter, S.G. "A General Interindustry Relatedness Index," *Management Science* (55:9), September 2009, pp 1570-1585.

Campbell, A., Goold, M., and Alexander, M. "Corporate Strategy: The Quest for Parenting Advantage," *Harvard Business Review* (73:2), March-April 1995, pp 120-132.

Cannella, A.A., and Hambrick, D.C. "Effects of Executive Departures on the Performance of Acquired Firms," *Strategic Management Journal* (14:S1) 1993, pp 137-152.

Capron, L., Dussauge, P., and Mitchell, W. "Resource Redeployment Following Horizontal Acquisitions in Europe and North America, 1988-1992," *Strategic Management Journal* (19:7), Jul 1998, pp 631-661.

Capron, L., and Mitchell, W. "Selection Capability: How Capability Gaps and Internal Social Frictions Affect Internal and External Strategic Renewal," *Organization Science* (20:2), Mar-Apr 2009, pp 294-312.

Capron, L., and Pistre, N. "When Do Acquirers Earn Abnormal Returns?," *Strategic Management Journal* (23:9) 2002, pp 781-794.

Chatterjee, S. "Sources of Value in Takeovers: Synergy or Restructuring -- Implications for Target and Bidder Firms," *Strategic Management Journal* (13:4) 1992, pp 267-286.

Chi, L., Ravichandran, T., and Andrevski, G. "Information Technology, Network Structure, and Competitive Action," *Information Systems Research* (21:3), September 1, 2010 2010, pp 543-570.

Cording, M., Christmann, P., and Weigelt, C. "Measuring Theoretically Complex Constructs: The Case of Acquisition Performance," *Strategic Organization* (8:1) 2010, pp 11-41.

Cuellar, A.E., and Gertler, P.J. "How the Expansion of Hospital Systems Has Affected Consumers," *Health Affairs* (24:1), January 1, 2005 2005, pp 213-219.

Datta, D.K. "Organizational Fit and Acquisition Performance: Effects of Post-Acquisition Integration," *Strategic Management Journal* (12:4) 1991, pp 281-297.

Dranove, D. "Economies of Scale in Non-Revenue Producing Cost Centers: Implications for Hospital Mergers," *Journal of Health Economics* (17:1) 1998, pp 69-83.

Dranove, D., Durkac, A., and Shanley, M. "Are Multihospital Systems More Efficient?," *Health Affairs* (15:1), February 1, 1996 1996, pp 100-104.

Dranove, D., and Shanley, M. "Cost Reductions or Reputation Enhancement as Motives for Mergers: The Logic of Multihospital Systems," *Strategic Management Journal* (16:1) 1995, pp 55-74.

Drnevich, P.L., and Croson, D.C. "Information Technology and Business-Level Strategy: Toward an Integrated Theoretical Perspective," *MIS Quarterly* (37:2) 2013, pp 483-510.

Edwards, J.R., and Lambert, L.S. "Methods for Integrating Moderation and Mediation : A General Analytical Framework Using Moderated Path Analysis," *Psychological Methods* (12:1) 2007, pp 1-22.

Ellis, K.M., Reus, T.H., Lamont, B.T., and Ranft, A.L. "Transfer Effects in Large Acquisitions: How Size-Specific Experience Matters," *Academy of Management Journal* (54:6), December 2011, pp 1261-1276.

Eschen, E., and Bresser, R.K.F. "Closing Resource Gaps: Toward a Resource-Based Theory of Advantageous Mergers and Acquisitions," *European Management Review* (2:3) 2005, pp 167-178.

Fichman, R.G., Kohli, R., and Krishnan, R. "The Role of Information Systems in Healthcare: Current Research and Future Trends," *Information Systems Research* (22:3) 2011, pp 419–428.

Goold, M., Campbell, A., and Alexander, M. "Corporate Strategy and Parenting Theory," *Long Range Planning* (31:2) 1998, pp 308-314.

Gould, W., Pitblado, J., and Sribney, W. *Maximum Likelihood Estimation with Stata*, (Fourth ed.) Stata Press, College Station, TX, 2010.

Greene, W.H. *Econometric Analysis*, (5th ed.) Prentice Hall, Upper Saddle River, NJ., 2002.

Grimpe, C., and Hussinger, K. "Pre-Empting Technology Competition through Firm Acquisitions," *Economics Letters* (100:2) 2008, pp 189-191.

Gurbaxani, V., and Whang, S. "The Impact of Information Systems on Organizations and Markets," *Communications of the ACM* (34:1) 1991, pp 59-73.

Haleblian, J., Devers, C.E., McNamara, G., Carpenter, M.A., and Davison, R.B. "Taking Stock of What We Know About Mergers and Acquisitions: A Review and Research Agenda," *Journal of Management* (35:3), Jun 2009, pp 469-502.

Hayford, T.B. "The Impact of Hospital Mergers on Treatment Intensity and Health Outcomes," *Health Services Research* (47:3), June 2012, pp 1008 - 1029.

Hayward, M.L.A., and Hambrick, D.C. "Explaining the Premiums Paid for Large Acquisitions: Evidence of CEO Hubris," *Administrative Science Quarterly* (42:1) 1997, pp 103-127.

Henderson, J.C., and Venkatraman, N. "Strategic Alignment: Leveraging Information Technology for Transforming Organizations," *IBM Systems Journal* (32:1) 1993, pp 472-484.

Henningsson, S., and Carlsson, S. "The DySIIM Model for Managing IS Integration in Mergers and Acquisitions," *Information Systems Journal* (21:5) 2011, pp 441-476.

Herzlinger, R.E. "Why Innovation in Health Care Is So Hard," *Harvard Business Review* (84:5), May 2006, pp 58-66.

Hitt, M.A., Hoskisson, R.E., Ireland, R.D., and Harrison, J.S. "Effects of Acquisitions on R&D Inputs and Outputs," *The Academy of Management Journal* (34:3) 1991, pp 693-706.

Ho, V., and Hamilton, B.H. "Hospital Mergers and Acquisitions: Does Market Consolidation Harm Patients?," *Journal of Health Economics* (19:5) 2000, pp 767-791.

Homburg, C., and Bucerius, M. "Is Speed of Integration Really a Success Factor of Mergers and Acquisitions? An Analysis of the Role of Internal and External Relatedness," *Strategic Management Journal* (27:4) 2006, pp 347-367.

Huckman, R.S. "Hospital Integration and Vertical Consolidation: An Analysis of Acquisitions in New York State," *Journal of Health Economics* (25:1) 2006, pp 58-80.

Jarrell, G.A., Brickley, J.A., and Netter, J.M. "The Market for Corporate Control: The Empirical Evidence since 1980," *Journal of Economic Perspectives* (2:1) 1988, pp 49-68.

Jensen, M.C. "Takeovers: Their Causes and Consequences," *The Journal of Economic Perspectives* (2:1) 1988, pp 21-48.

Jensen, M.C., and Ruback, R.S. "The Market for Corporate Control: The Scientific Evidence," *Journal of Financial Economics* (11:1–4) 1983, pp 5-50.

Jensen, R.J., and Szulanski, G. "Template Use and the Effectiveness of Knowledge Transfer," *Management Science* (53:11), Nov 2007, pp 1716-1730.

Johnston, K.D., and Yetton, P.W. "Integrating Information Technology Divisions in a Bank Merger - Fit, Compatibility and Models of Change," *Journal of Strategic Information Systems* (5:3), Sep 1996, pp 189-211.

Karim, S., and Mitchell, W. "Path-Dependent and Path-Breaking Change: Reconfiguring Business Resources Following Acquisitions in the U.S. Medical Sector, 1978–1995," *Strategic Management Journal* (21:10/11) 2000, pp 1061-1081.

Kettinger, W.J., and Grover, V. "Toward a Theory of Business Process Change Management," *Journal of Management Information Systems* (12:1) 1995, pp 9-30.

King, D.R., Dalton, D.R., Daily, C.M., and Covin, J.G. "Meta-Analyses of Post-Acquisition Performance: Indications of Unidentified Moderators," *Strategic Management Journal* (25:2) 2004, pp 187-200.

Kohli, R., Devaraj, S., and Ow, T.T. "Does Information Technology Investment Influence a Firm's Market Value? A Case of Non-Publicly Traded Healthcare Firms," *MIS Quarterly* (36:4) 2012, pp 1145-1163.

Kohli, R., and Grover, V. "Business Value of IT: An Essay on Expanding Research Directions to Keep up with the Times," *Journal of the Association for Information Systems* (9:1), January 2008, pp 23-39.

Levin-Scherz, J. "What Drives High Health Care Costs--and How to Fight Back," *Harvard Business Review* (88:4) 2010, pp 72-73.

Levinthal, D.A., and Wu, B. "Opportunity Costs and Non-Scale Free Capabilities: Profit Maximization, Corporate Scope, and Profit Margins," *Strategic Management Journal* (31) 2010, pp 780-801.

Lu, Y., and Ramamurthy, K. "Understanding the Link between Information Technology Capability and Organizational Agility: An Empirical Examination," *MIS Quarterly* (35:4) 2011, pp 931-954.

Manne, H.G. "Mergers and the Market for Corporate Control," *Journal of Political Economy* (73:2) 1965, pp 110-120.

Markus, M.L. "Reflections on the Systems Integration Enterprise," *Business Process Management Journal* (7:3) 2001, pp 1-9.

McAfee, A., and Brynjolfsson, E. "Investing in the IT That Makes a Competitive Difference," *Harvard Business Review* (86:7/8) 2008, pp 98-107.

McCullough, J.S., and Snir, E.M. "Monitoring Technology and Firm Boundaries: Physician–Hospital Integration and Technology Utilization," *Journal of Health Economics* (29:3) 2010, pp 457-467.

McNamara, G.M., Haleblain, J., and Dykes, B.J. "The Performance Implications of Participating in an Acquisition Wave: Early Mover Advantages, Bandwagon Effects, and the Moderating Influence of Industry Characteristics and Acquirer Tactics," *Academy of Management Journal* (51:1) 2008, pp 113-130.

Mehta, M., and Hirschheim, R. "Strategic Alignment in Mergers and Acquisitions: Theorizing IS Integration Decision Making," *Journal of the Association for Information Systems* (8:3) 2007, pp 143-174.

Menon, N., Yaylacicegi, U., and Cezar, A. "Differential Effects of the Two Types of Information Systems: A Hospital-Based Study," *Journal of Management Information Systems* (26:1) 2009, pp 297-316.

Merali, Y., and McKiernan, P. "The Strategic Positioning of Information Systems in Post-Acquisition Management," *Journal of Strategic Information Systems* (2:2) 1993, pp 105-124.

Mithas, S., Krishnan, M.S., and Fornell, C. "Why Do Customer Relationship Management Applications Affect Customer Satisfaction?," *Journal of Marketing* (69:4) 2005, pp 201–209.

Mithas, S., Ramasubbu, N., and Sambamurthy, V. "How Information Management Capability Influences Firm Performance," *MIS Quarterly* (35:1) 2011, pp 237-256.

Moeller, S.B., Schlingemann, F.P., and Stulz, R.M. "Firm Size and the Gains from Acquisitions," *Journal of Financial Economics* (73:2) 2004, pp 201-228.

Muller, D., Judd, C.M., and Yzerbyt, V.Y. "When Moderation Is Mediated and Mediation Is Moderated," *Journal of Personality and Social Psychology* (89:6), Dec. 2005, pp 852-863.

Nembhard, I.M., Alexander, J.A., Hoff, T.J., and Ramanujam, R. "Why Does the Quality of Health Care Continue to Lag? Insights from Management Research " *The Academy of Management Perspectives* (23:1) 2009, pp 24-42.

Nevo, S., and Wade, M.R. "The Formation and Value of IT-Enabled Resources: Antecedents and Consequences," *MIS Quarterly* (34:1) 2010, pp 163-183.

Pablo, A.L. "Determinants of Acquisition Integration Level - a Decision-Making Perspective," *Academy of Management Journal* (37:4), Aug 1994, pp 803-836.

Palepu, K. "Diversification Strategy, Profit Performance and the Entropy Measure," *Strategic Management Journal* (6:3) 1985, pp 239-255.

Paruchuri, S., Nerkar, A., and Hambrick, D.C. "Acquisition Integration and Productivity Losses in the Technical Core: Disruption of Inventors in Acquired Companies," *Organization Science* (17:5) 2006, pp 545-562.

Pavlou, P.A., and El Sawy, O.A. "From IT Leveraging Competence to Competitive Advantage in Turbulent Environments: The Case of New Product Development," *Information Systems Research* (17:3), Sep 2006, pp 198-227.

Pavlou, P.A., and El Sawy, O.A. "The "Third Hand": IT-Enabled Competitive Advantage in Turbulence through Improvisational Capabilities," *Information Systems Research* (21:3) 2010, pp 443-471.

Pehrsson, A. "Business Relatedness and Performance: A Study of Managerial Perceptions," *Strategic Management Journal* (27:3) 2006, pp 265-282.

Porter, M.E. "What Is Strategy," *Harvard Business Review* (74:6), November-December 1996, pp 61-78.

Porter, M.E., and Teisberg, E.O. "Redefining Competition in Health Care," *Harvard Business Review* (82:6) 2004, pp 64-76.

Rai, A., Patnayakuni, R., and Seth, N. "Firm Performance Impacts of Digitally-Enabled Supply Chain Integration Capabilities," *MIS Quarterly* (30:2) 2006, pp 225-246.

Ravichandran, T., Liu, Y., Han, S., and Hasan, I. "Diversification and Firm Performance: Exploring the Moderating Effects of Information Technology Spending," *Journal of Management Information Systems* (25:4), Spring2009 2009, pp 205-240.

Ray, G., Barney, J.B., and Muhanna, W.A. "Capabilities, Business Processes, and Competitive Advantage: Choosing the Dependent Variable in Empirical Tests of the Resource-Based View," *Strategic Management Journal* (25:1) 2004, pp 23-37.

Rettig, C. "The Trouble with Enterprise Software," *MIT Sloan Management Review* (49:1) 2007, pp 21-27.

Robins, J., and Wiersema, M.F. "A Resource-Based Approach to the Multibusiness Firm: Empirical Analysis of Portfolio Interrelationships and Corporate Financial Performance," *Strategic Management Journal* (16:4) 1995, pp 277-299.

Ross, J. "Creating a Strategic IT Architecture Competency: Learning in Stages " *MIS Quarterly Executive* (2:1) 2003, pp 31-43.

Ross, J.W., Weill, P., and Robertson, D. *Enterprise Architecture as Strategy: Creating a Foundation for Business Execution* Harvard Business School Press, Boston, MA, 2006.

Rucker, D.D., Preacher, K.J., Tormala, Z.L., and Petty, R.E. "Mediation Analysis in Social Psychology: Current Practices and New Recommendations," *Social and Personality Psychology Compass* (5:6) 2011, pp 359-371.

Rumelt, R.P. *Strategy, Structure, and Economic Performance* Harvard University Press, Cambridge, MA, 1974.

Salvato, C. "Capabilities Unveiled: The Role of Ordinary Activities in the Evolution of Product Development Processes," *Organization Science* (20:2), March/April 2009 2009, pp 384-409.

Sambamurthy, V., Bharadwaj, A., and Grover, V. "Shaping Agility through Digital Options: Reconceptualizing the Role of Information Technology in Contemporary Firms," *MIS Quarterly* (27:2) 2003, pp 237-263.

Sanofi-Aventis "Sanofi-Aventis Managed Care Digest Series® / Hospitals/Systems Digest 2011- 2012", 2011, Retrieved July 16th, 2012, from http://www.managedcaredigest.com/pdf/HospDigest2011.pdf.

Sarrazin, H., and West, A. "Understanding the Strategic Value of IT in M&A," *McKinseyQuarterly* (2011:January) 2011, pp 1-6.

Schilling, M.A., Vidal, P., Ployhart, R.E., and Marangoni, A. "Learning by Doing Something Else: Variation, Relatedness, and the Learning Curve," *Management Science* (49:1), January 2003, pp 39-56.

Seth, A. "Value Creation in Acquisitions: A Re-Examination of Performance Issues," *Strategic Management Journal* (11:2) 1990, pp 99-115.

Shwartz, M., Ren, J., Peköz, E.A., Wang, X., Cohen, A.B., and Restuccia, J.D. "Estimating a Composite Measure of Hospital Quality from the Hospital Compare Database: Differences When Using a Bayesian Hierarchical Latent Variable Model Versus Denominator-Based Weights," *Medical Care* (46:8) 2008, pp 778-785.

Spiller, S.A., Fitzsimons, G.J., Lynch, J.G., and McClelland, G.H. "Spotlights, Floodlights, and the Magic Number Zero: Simple Effects Tests in Moderated Regression," *Journal of Marketing Research* (50:2), 2013/04/01 2013, pp 277-288.

Tanriverdi, H. "Information Technology Relatedness, Knowledge Management Capability, and Performance of Multibusiness Firms.," *MIS Quarterly* (29:2), Jun 2005, pp 311-334.

Tanriverdi, H. "Performance Effects of Information Technology Synergies in Multibusiness Firms," *MIS Quarterly* (30:1), Mar 2006, pp 57-77.

Tanriverdi, H., and Du, K. "Trinity Health: Using a Digital Platform and a Unified Model to Create Value in Merger, Acquisition, and Divestiture Transactions," in: *MIT Center for Information Systems Research (CISR) Working Paper No.386*, 2011.

Tanriverdi, H., Rai, A., and Venkatraman, N. "Reframing the Dominant Quests of Information Systems Strategy Research for Complex Adaptive Business Systems," *Information Systems Research* (21:4), December 2010, pp 822-834.

Tanriverdi, H., and Uysal, V. "Cross-Business Information Technology Integration and Acquirer Value Creation in Corporate Mergers and Acquisitions," *Information Systems Research* (22:4), December 2011, pp 703-720.

Tanriverdi, H., and Uysal, V.B. "When IT Capabilities Are Not Scale-Free in Merger and Acquisition Integrations: How Do Capital Markets React to IT Capability Asymmetries between Acquirer and Target?," *European Journal of Information Systems*) Forthcoming.

Teece, D.J. "Explicating Dynamic Capabilities: The Nature and Microfoundations of (Sustainable) Enterprise Performance," *Strategic Management Journal* (28:13) 2007, pp 1319-1350.

Tiwana, A., and Konsynski, B. "Complementarities between Organizational IT Architecture and Governance Structure," *Information Systems Research* (21:2) 2010, pp 288-304.

Venkatesh, V., Bala, H., Venkatraman, S., and Bates, J. "Enterprise Architecture Maturity: The Story of the Veterans Health Administration," *MIS Quarterly Executive* (6:2), June 2007, pp 79-90.

Wan, W.P., Hoskisson, R.E., Short, J.C., and Yiu, D.W. "Resource-Based Theory and Corporate Diversification: Accomplishments and Opportunities," *Journal of Management* (37:5), September 2011, pp 1335-1368.

Wang, N., Liang, H., Zhong, W., Xue, Y., and Xiao, J. "Resource Structuring or Capability Building? An Empirical Study of the Business Value of Information Technology," *Journal of Management Information Systems* (29:2), Fall2012 2012, pp 325-367.

Werner, R.M., and Bradlow, E.T. "Relationship between Medicare's Hospital Compare Performance Measures and Mortality Rates," *The Journal of the American Medical Association* (296:22) 2006, pp 2694-2702.

Wernerfelt, B. "A Resource-Based View of the Firm," *Strategic Management Journal* (5:2) 1984, pp 171-180.

Wijnhoven, F., Spil, T., Stegwee, R., and Fa, R.T.A. "Post-Merger IT Integration Strategies: An IT Alignment Perspective," *Journal of Strategic Information Systems* (15:1) 2006, pp 5-28.

Williamson, O.E. "Strategy Research: Governance and Competence Perspectives," *Strategic Management Journal* (20:12) 1999, pp 1087-1108.

Zhang, J. "Recession Likely to Boost Government Outlays on Health Care " *Wall Street Journal*), February 24 2009.

Zollo, M., and Meier, D. "What Is M&A Performance?," *Academy of Management Perspectives* (22:3) 2008, pp p55-77.

Zollo, M., and Singh, H. "Deliberate Learning in Corporate Acquisitions: Post-Acquisition Strategies and Integration Capability in US Bank Mergers," *Strategic Management Journal* (25:13), Dec 2004, pp 1233-1256.

Zollo, M., and Winter, S.G. "Deliberate Learning and the Evolution of Dynamic Capabilities," *Organization Science* (13:3), May-Jun 2002, pp 339-351.